FINAL ENVIRONMENTAL IMPACT STATEMENT

South Beal Project

Prepared by:

Montana Department of State Lands

and

DeerLodge National Forest

June 30, 1993

Deerlodge National Forest
Butte Ranger District
Box 3840
Butte, MT 59702

Montana Department of
State Lands
Capitol Station
Helena, MT 59620

Reply to: 2810

June 30, 1993

Dear reader:

Enclosed is a copy of the final Environmental Impact Statement (EIS) for Beal Mountain Mining Company's proposed South Beal Project. The South Beal Project is the development of two small pits in the German Gulch Drainage 16 miles southwest of Butte.

The Montana Department of State Lands and the Deerlodge National Forest have prepared this EIS for your review. In addition, the Agencies are preparing a Wildlife Biological Assessment (BA) and Biological Evaluations (BE's)for fish and plants pursuant to the Endangered Species Act. The BA will contain additional technical information regarding endangered, threatened and sensitive species and potential mitigation. It should be considered a technical appendix to this document. The BA for wildlife and the BE's for fish and plants will be attached to the Record of Decision.

Additional copies of this EIS are available at the addresses shown below. Thank you for your interest.

Sincerely,

Margaret C Ewing

Margaret C. Ewing
Butte Ranger District
Deerlodge National Forest
Box 3840
Butte, MT 59702
(406) 494-2174

Mike DaSilva

Mike DaSilva
Montana Department of
State Lands
Capitol Station
Helena, MT 59620
(406) 444-2074

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COVER SHEET

Type of Statement

Final Environmental Impact Statement

Proposed Action

Construction and Operation of South Beal Project

Lead Agencies

Deerlodge National Forest

Montana Department of State Lands

Responsible Officials

Margie Ewing, District Ranger, Deerlodge National Forest, Box 3840, Butte, MT 59701
Bud Clinch, Commissioner of State Lands, Department of State Lands, Capitol Station, Helena, MT 59601

Abstract

The South Beal Environmental Impact Statement (EIS) describes the resources that may be affected by the approval of the proposed South Beal Project. The major state and federal action is the approval of necessary permits to construct and operate the South Beal Project. The proposed project would consists of two small open pits that would be backfilled and reclaimed after they are mined out. Ore would be hauled to the existing heap for processing and removal of precious metals. Waste rock would be hauled to the existing waste rock facility. Three alternatives are analyzed in detail in this Final EIS and include the proposed action, a mitigated alternative, and the no action alternative.

Comment Period

This is a Final Environmental Impact Statement. Implementation may begin 7 days after the Record of Decison is signed by the responsible official for the Forest Service. The Deparment of State Lands may make a permit decision 15 days after the document is made available to the public.

For further information contact:

Margie Ewing
Deerlodge National Forest
Box 3840
Butte, MT 59702
(406)494-2147

Mike DaSilva
Montana Department of State Lands
Capitol Station
Helena, MT 59620
(406)444-2074

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SOUTH BEAL PROJECT EIS

SUMMARY

Each chapter that appeared in the Draft EIS begins with a summary of changes that were made between the release of the Draft EIS and the release of the Final EIS. This summary of changes highlights the major changes from each chapter.

Spelling corrections and editing which did not change the meaning of sentences are not identified as changes to the Draft EIS.

The Summary was edited to correspond to the changes made in the main body of the document. These changes are most apparent in Chapters II and IV. Chapter I was rewritten to better define the purpose and need. Changes in Chapter II include a more detailed accounting of the scoping process, additional mitigation and monitoring measures for Alternative 2, and the dismissal of several issues from being carried through the document. Chapter III changes included mostly clarification and additional background information as well as additional references. Chapter IV changes reflected the dismissal of several issues as well as a substantive addition to the environmental consequences of the the proposed action and it's alternatives.

SUMMARY

This document summarizes the Environmental Impact Statement (EIS) for the proposed South Beal Project. This summary document cannot contain all the detailed information in the EIS. For a copy of the EIS please contact:

Liz McFarland
Deerlodge National Forest
Box 3840
Butte, MT 59702
(406)494-2147

Mike DaSilva
Montana Department of State Lands
Capitol Station
Helena, MT 59620
(406)444-2074

THE EIS AND PERMITTING PROCESS FOR THE SOUTH BEAL PROJECT

The South Beal Project is a proposed expansion of the Beal Mountain Mine. The Department of State Lands (DSL) and the Deerlodge National Forest (DNF) are the "lead" government agencies. The DSL and DNF must approve, approve with modifications, or deny the expansion proposal.

The Beal Mountain Mine is a gold and silver mine located in Silver Bow County, Montana, about 16 air miles southwest of Butte. Beal Mountain Mining Incorporated (BMMI), a wholly owned subsidiary of Pegasus Gold Corporation of Spokane, Washington, operates the mine under Operating Permit 00135 from the DSL. On August 18, 1992, BMMI submitted an operating permit amendment application. The proposal was determined complete on March 3, 1993. In the amendment, BMMI proposes to develop a one million ton gold ore body on the south side of German Gulch, on National Forest System land, within the existing boundary of Operating Permit 00135. This proposed expansion is known as the South Beal Project.

The proposal is to develop two small open pits that would be backfilled and reclaimed after they are mined out. Existing facilities would be used for processing the ore. Mining would occur during the 1993 and 1994 mining seasons, reclamation would be completed the following year. The total number of acres disturbed by BMMI would increase from 424.8 acres to 450 acres, a net increase of 25.2 acres.

This proposal would extend the life of the Beal Mountain Mine by one year. The proposal is a result of ongoing exploration in the area of the mine. The current reclamation bond total is set at $2,770,000. The existing BMMI reclamation bond is projected to increase by $400,000 to $500,000 to cover disturbances from the proposed South Beal project.

The original permit document (Beal Mountain Mining, Inc., 1988), the amendment application (Beal Mountain Mining, Inc., 1992a), the original 1988 Preliminary Environmental Review (Montana Department of State Lands; U.S. Forest Service, 1988), and various support documents (Schafer et al., 1992a, 1992b and 1992c) are on file and available for review at the DSL office at 1625 Eleventh Ave., Helena, Montana 59620, and the DNF office at 1820 Meadowlark, Butte, Montana 59701. This EIS and summary describe the agencies' analysis of potential environmental consequences of the proposed action and alternatives.

PUBLIC PARTICIPATION

The DSL and USFS sought public and other agencies' input to help identify environmental issues and concerns with BMMI's proposal through the scoping process. Scoping activities for this project included holding a public meeting in Butte, Montana, on February 6, 1992, letters to citizens and groups interested in activities in the project area, and soliciting written comments through a newspaper article (MT Standard, January 24, 1992). The agencies also published a legal notice in the newspaper for three consecutive weeks.

The public comment period was held open until February 21, 1992. In addition, notices concerning the initiation of the EIS and the release of the Draft EIS were placed in the Federal Register. Coordination efforts also involved the input of the Montana state office of the EPA, the Water Quality Bureau and the Fish, Wildlife and Parks Department.In addition to the public meeting and letters, BMMI conducted meetings with local groups to discuss the proposal.

ENVIRONMENTAL ISSUES

Potential for Acid Rock Drainage

To date elevated levels of sulfate have been detected at the monitoring stations near the main Beal waste rock facility. Although the source has not been verified, there is a concern that this could be a precursor to Acid Rock Drainage (ARD).

Ground and Surface Water Quality

Currently some monitoring stations have had readings which exceed State Water Quality Standards. Operational problems with water quality at BMMI indicate nonpoint sources of degradation such as sediment, nitrate, and sulfate are not controlled with the use of BMMI's existing Best Management Practices or mitigation measures. BMMI is now undertaking studies to determine the sources of nitrate and sulfate in order to identify additional management practices for control.

Would the proposed action contribute to the existing problems with sediments and concentrations of total suspended solids, total dissolved solids, nitrate, nitrite, nutrient, sulfate and other metals?

Wildlife

The existing Beal Mountain Mine has been in place since 1988. The project affected approximately 450 acres of wildlife habitat. The effects ranged from removal of wildlife habitat to temporary disturbance. The proposed project would expand the mine activity to the south of where it is now located and involve an additional 25 acres of disturbance.

Wildlife concerns specific to the proposed expansion include questions about additional habitat modification, displacement of animals, and cumulative effects with existing mining disturbance.

ISSUES CONSIDERED BUT DISMISSED FROM FURTHER DISCUSSION

Issues which were considered by the agencies but dismissed from further discussion were: cyanide in ground and surface water, fisheries, pit stability, soil resources and vegetation, vegetation and land use, air quality, cultural resources, and seismicity.

ALTERNATIVES DISCUSSED IN THE EIS

The South Beal Project as proposed by BMMI (Alternative 1) is to mine 959,840 tons of gold-bearing ore from two small open pits. BMMI would build a 500-600 foot long access road from the haulage road on the south side of the German Gulch drainage to the pits. Ore from the South Beal deposit would be hauled uphill through the existing waste rock dump area to the coarse ore stockpile. It would then be crushed, agglomerated and truck-loaded onto the existing leach pad. The plan would change the permitted tonnage of ore on the heap from 10 million tons to 11 million tons, which is within the designed pad capacity of 16 million tons (Lkohn Leonoff et al., 1992). A diluted cyanide solution would be used to extract the gold mineral from the ore. This amendment does not change the existing leaching process.

Approximately 1,289,000 tons of waste rock material would have to be removed from the two open pits during mining. The waste rock would be removed by blasting and dozing. It would then be loaded and hauled to the existing waste rock dump.

Alternative 2 consists of modifications to BMMI's South Beal Project. Modifications include mitigations measures designed to reduce or eliminate adverse environmental impacts and increase the amount of operational and post-operational monitoring.

Alternative 3 is the No Action alternative. BMMI would not develop the South Beal Project. The Beal Mountain Mine would continue as currently permitted.

THE AFFECTED ENVIRONMENT

The proposed South Beal Project is located within National Forest System lands administered by the DNF. The general management plan, for the DNF is found in the Forest Plan, which is available for review at the DNF Supervisor's Office in Butte. The following discussion highlights Forest-wide and Management Area goals and objectives relevant to the South Beal Project.

The Beal Mountain Mine is located within the High Rye Elk Hunting Recreation Opportunity Geographic Area (EHROGA). Twenty-two acres, 87 percent of the proposed action, is within MA E-1, which consists of productive forest land containing stands of Douglas fir, lodgepole pine, subalpine fir and spruce. The lower, northeast edge of the proposed pit and a portion of the haul road, 3.3 acres, 13 percent of the proposed action, are within MA A-6, which consists of nonforest and forested land where timber management and range or wildlife improvements are currently uneconomical or environmentally infeasible.

The host rocks for the South Beal deposit are interbedded calcareous impure quartzite, metamorphosed mudstones and dense, chalky white marbles. The deposit is in a single bed about 32 feet thick and dipping 15 to 20 degrees northeast, almost paralleling the north-facing hillside slope. Due to this slope-paralleling dip and extensive fracturing of the rock, some minor creeping occurs on the hillside. The creeping creates some minor instability in the existing topography and somewhat reduces the stability of the surface and sub-surface material.

In the highwall of the existing pit is a northwest trending fault, the Gully fault zone extends to the southwest along the southwest corner of the leach pad. The width of the fault zone to the northeast is not known. Other important geologic features are the bedding planes which dip to the south into the Gully fault zone. Recently, movement has been noted on the bedding plane. The movement has produced a major slump of a portion of the highwall in the direction of the existing pit. Movement of the material in the trough formed by the intersection of the fault and the bedding plane has produced a slumping in the main pit.

Extensive exploratory drilling in the area of the proposed South Beal pits shows that the water table is located 25 to 50 feet deeper than the proposed pit floors. Water samples taken from drill holes SBP 1 and SBP 2 indicate that existing ground water quality in this area is good.

German Gulch water quality is generally good and is classified as B-1, suitable for drinking, culinary and food processing purposes, after conventional treatment; and is suitable for bathing, swimming, and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers and agricultural and industrial water supply.

Surface water quality in German Gulch has changed since baseline data were collected in 1987 and 1988 for the main Beal mine. The water quality parameters which have changed considerably in the creek monitoring stations are total dissolved solids (TDS), sulfates, and nitrates.

The German Gulch Drainage is part of the Fleecer Mountain complex. The area contains important wildlife resources which are fully discussed in the EIS. Important biological components of the drainage include regional linkages, edges, riparian areas, lodgepole pine/Douglas-fir forests and associated species, old growth and associated species, and grasslands.

German Gulch supports a pure strain of westslope cutthroat trout. Westslope cutthroat trout populations were estimated in 1984 at 525 fish 6-10 inches in length per mile of stream near Beefstraight Creek and 230 westslope cutthroat 6-10 inches in length per mile of stream near Edwards Creek. Evaluation of fine sediment (41.6 percent) and cobble embeddedness (34.5 percent), conducted in 1988, indicate spawning and rearing substrate to be in fair condition.

CONSEQUENCES OF THE PROPOSED PROJECT AND ALTERNATIVES

The Potential for Acid Rock Drainage

The rocks associated with the South Beal deposit contain some sulfides, so there is some potential for acid rock drainage. BMMI has proposed a rock monitoring program which would allow the company and the agencies to predetermine if the heap or the waste rock will produce acid rock drainage and to prevent any such serious problem. If acid production occurs, BMMI has committed to address the problem. BMMI must monitor the interior of the waste dump to help distinguish potential sources for the existing sulfate concentrations. BMMI would also implement additional testing if the agencies determine it is necessary. This monitoring would give the agencies more data to predict and define the potential for contaminant leaching.

If iron disulfie oxidation is found to be occurring, BMMI would be required to segregate their waste to isolate the reactive waste. If appropriate, the waste rock facility and the heap leach area would be capped with an effective capping sequence (see Alternative 2).

With Alternative 3, the no action alternative, if contaminated leachate were to become problematic, the agencies could review BMMI's reclamation plan for main Beal under Section 337 of the Metal Mine Reclamation Act. Also with Alternative 3, if contaminated leachate occurs from the current operations, the marble waste rock from the South Beal waste rock would not be available to cap acid producing rock from main Beal. There is suitable neutral capping material available from unmineralized, undisturbed areas within the current permit boundary. Any possibility for contaminated leachate from South Beal or waste rock would be eliminated if Alternative 3 were selected.

Ground and Surface Water Quality

Impacts to ground water from mining the South Beal pits are expected to be minimal because the pits would be open for only two years and would have a short-term effect on ground water. The water table under the proposed South Beal pits is 25 to 50 feet below the estimated levels of the pit floors, so ground water would not come in contact with backfilled waste from main Beal.

There is an unresolved concern regarding sulfate release from main Beal waste rock, which would be used to backfill the pits. Static and kinetic tests are ongoing to help determine whether backfill material would be potentially acid producing. Water quality test results from springs discharging below the main Beal waste rock dump indicate that main Beal waste may contribute sulfates to ground water (Beal Mountain Mining Inc., 1993, 1992c).The source of the sulfate source is uncertain. In addition to the acid forming oxidation of pyrite, sulfates in ground water may have come from mulch and/or fertilizer used in reclamation, runoff from slash piles or burned areas and dissolution of sulfate minerals such as gypsum or anhydrite found in the rock hosting the gold deposits.

If water infiltrates into the backfilled pits, sulfates could be produced and enter ground water. Successful reclamation would minimize any potential for impacts to ground water from the release of sulfates. Reclamation and revegetation would reduce infiltration by increasing evapotranspiration.

Surface Water Quality

The concentration of nitrates and sulfates released from the waste rock facility may continue to increase with the addition of the South Beal waste. The rate of their increase is not expected to change because the rate of placement on the facility would remain the same.

The potential that nitrates discharge to ground water downgradient of the South Beal pits would reach surface water in German Gulch is minimal due to the distance between the pits and the stream and the opportunity for uptake by vegetation.

Sulfates are expected to be released from the South Beal ore, but pH of this water is expected to remain neutral. If South Beal ore were to start producing acid or harmful effluent, BMMI has committed to a contingency plan, described in Chapter 2, that should effectively address the problems. The heap is part of a zero discharge circuit, and would not release any water to surface water.

A Land Application Disposal (LAD) system is currently in place and could be used if the process water in the leach pad reaches capacity. Before maximum capacity is reached, BMMI would treat excess process water for cyanide destruction and would discharge excess process water on their approved LAD site located on Beal's Hill (Figure 1). BMMI is required to chemically characterize the excess treated process water before and during land application disposal. The LAD area is equipped with suction lysimeters to determine if metals are attenuated. Past testing has demonstrated that all metals would be attenuated (Schafer et al., 1992a)

The 600 feet of new road may contribute some sediment to German Gulch.

Wildlife

The action alternatives would have short-term effects on wildlife habitat.

CHANGES FROM DRAFT TO FINAL
SOUTH BEAL PROJECT EIS

CHAPTER I

Spelling corrections and editing which did not change the meaning of sentences are not identified as changes to the Draft EIS.

Proposed Action

More detailed information regarding the Proposed Action is given.

Background

Additional environmental effects predicted from the 1988 Main Beal EA/PER are included.

Purpose and Need

Additional legal authority and responsibilities of the Montana Department of State Lands and U.S. Forest Service are given.

Public Participation and Issues and Concerns Raised in Scoping

These sections were moved to Chapter II-Alternatives.

I - PURPOSE AND NEED

A. PROPOSED ACTION

The Montana Department of State Lands and the Butte District of the Deerlodge National Forest have received an application for expansion from Beal Mountain Mine Inc. (BMMI). The expansion proposal is called the South Beal Project and would be an amendment to Operating Permit Number 00135 (O.P. 00135).

The Beal Mountain Mine is a gold and silver mine located in Silver Bow County, Montana, about 16 air miles southwest of Butte in Township 2N, Range 10W, Sections 5, 6, and 7; and Township 3N Range 10W, Sections 31, and 32, Montana Principal Meridian. The project area involves National Forest System lands and patented land owned by BMMI. See Figure I-1 for project location.

BMMI, a wholly owned subsidiary of Pegasus Gold Corporation of Spokane, Washington, operates the mine under Operating Permit 00135 which was issued on July 8, 1988, by the Department of State Lands. Currently BMMI is mining seasonally from March 1 through the end of November using a cyanide heap leach process for precious metal recovery. Leaching is carried on year round with the use of buried emitters in the leach pad during winter months and an above ground sprinkler system during the remainder of the year.

BMMI first submitted the South Beal Project amendment on January 21, 1992. BMMI later withdrew the amendment and resubmitted on August 18, 1992. The proposal was determined to be complete on March 3, 1993, by the Department of State Lands. The amendment as proposed by BMMI would develop a one million ton gold ore body on the south side of German Gulch.

The proposal is to mine approximately one million tons of ore from two small open pits located on the south side of German Gulch within the existing permit boundary. The pits would create a surface disturbance of approximately 25.2 acres. After mining the two pits would be backfilled and reclaimed. As designed, the pits would not intersect the groundwater table in the area nor would the proposal impact German Gulch. Mining would be completed during the 1994 mining season and reclamation would be completed the following year. The total number of acres disturbed by BMMI would increase from 424.8 acres to 450 acres.

This proposal, which would extend the life of the Beal Mountain Mine by one year, has been proposed as a result of ongoing exploration in the vicinity of the mine. The current reclamation bond total is set at $2,770,000. If the amendment is approved, the bond amount would be adjusted to account for reclamation of the South Beal pits including backfilling, as well as reduced main haul road disturbance. The reclamation bond is projected to increase by $400,000 to $500,000 for the proposed disturbances.

The original application and permit document (Beal Mining, Inc., 1998), the amendment applications (Beal Mountain Mining, Inc., 1992), the 1988 Preliminary Environmental Review (Montana Department of State Lands, 1988, and U.S. Forest Service, 1988), and various support and monitoring documents (Schafer et all., 1992a, 1992b and 1992c) are on file and available for review at the Department of State Lands office at 1625 Eleventh Ave., Helena, Montana 59620, and the Deerlodge National Forest office at 1820 Meadowlark, Butte, Montana 59702.

Background

BMMI's initial plan of operations and reclamation plan (Beal Mountain Mining, 1988) were approved by the Department of State Lands and the Deerlodge National Forest in July of 1988. The plan consisted of mining approximately 16.4 million tons of rock over a 10 year span. The ore from the open pit mine would be crushed, agglomerated and heaped on a pad for subsequent precious metal removal and recovery. Waste would be placed on lifts in a waste repository with concurrent reclamation. The agencies prepared and distributed an Environmental Assessment (EA), formerly known as a Preliminary Environmental Review (PER) in July, 1988 and concluded:

Beal Mountain Mine "would have both long and short-term environmental effects in German Gulch; however, these would not be significant in terms of either areal extent or severity of impact. The effects of the mine would mostly occur during construction and operations, and would mostly be confined to the German Gulch drainage and the road access corridor. The proposed operating plan, engineering design, and implementation of environmental management and contingency plans would significantly minimize potential adverse effects of mining.

Reclamation would stabilize surface disturbances and replace forage, cover and habitat that would be temporarily displaced by mining. The open pit, waste rock dump, and heap are not expected to cause acid drainage, either during operations or after mining. Similarly, minor disruptions of the hydrological relationships in the mine area would have minimal impact on water quality and flows of upper German Gulch."

Operating Permit 00135 was issued on July 8, 1998. The current production rate at the Beal Mountain Mine is approximately 3 to 4 million tons of rock per year with mining occurring approximately 180-200 days per year, occurring from March to November. Of the 3 to 4 million tons mined per year, approximately 1.5 to 2 million tons is ore and approximately 1.5 to 2 million tons is waste material. The mine will produce ore and waste at the above rate for a period of approximately 5 to 8 years. Ore processing was originally permitted on a seasonal basis however, BMMI is now processing on a year-round basis. The current workforce is approximately 106-125 workers. No new employment is anticipated.

In August 1992, BMMI applied for Amendment No.1 to Operating Permit 00135. Amendment No.1 (Beal Mountain Mining Inc., 1992b) moved the haul road from the north side of German Gulch drainage to the south side. An EA/PER (Montana Department of State Lands et al., 1992) was prepared and DSL and the DNF approved the road on August 14, 1992.

BMMI submitted the South Beal Amendment to Operating Permit 00135 (Beal Mountain Mining Inc., 1992a) in early fall of 1992. The application for amendment to Operating Permit 00135 was deemed complete by the Department of State Lands on March 3, 1993. The current proposal, if approved, would be the second amendment to the permit.

B. PURPOSE AND NEED

Both State and Federal agencies have roles and responsibilities in mine permitting and administration. The following discussion highlights the regulations and responsibilities of each agency as it relates to the purpose and need.

Department of State Lands

The Department of State Lands (DSL) administers the Montana Metal Mine Reclamation Act (MMRA). The purpose of the act is to recognize and protect the usefulness, productivity and scenic values of the lands and waters within the state and to reclaim the lands used for mining to comparable stability and utility for beneficial uses. The act and its regulations (ARM 26.4.101 et seq.) set forth the steps to be taken in the issuance of an operating permit for and the reclamation of the applicant's proposed mine expansion. The act applies to all private, federal and state lands within Montana.

The Commissioner of State Lands must decide whether to approve Beal Mountain Mining Inc.'s application as applied for, approve the application subject to stipulations, or deny the permit, as required by the MMRA Title 82, Chapter 4, Part 3, MCA.

United States Forest Service

The United States mining laws (30 U.S.C. 21-54) confer a statutory right to enter upon the public lands to search for minerals. Forest Service regulations (36 CFR 228 subpart A), among others, require that mineral operations be conducted so as to minimize adverse environmental impacts on national Forest System surface resources. It is Forest Service policy to encourage and facilitate the orderly exploration, development and production of mineral resources from National Forest System lands. At the same time, the Forest Service is charged to ensure that these activities are conducted in an environmentally sound manner and that once completed, reclamation of the land to a stable and usable condition is accomplished.

Other State Agencies

State Historic Preservation Office

The State Historic Preservation Office (SHPO) is responsible for cooperating with and advising DSL and the USFS when potentially valuable historical, archaeological, or other cultural resources are located within a project area (Montana Antiquities Act Sections 22-3-401 through 22-3-442, MCA, and the National Historical Preservation Act [P.L. 89-665 as amended and reauthorized E.O. 11593]). Advice given to the agencies may include comments on an applicant's plan for impact mitigation of sites eligible for nomination to the National Register of Historic Places. The office also reviews the EA or EIS to ensure compliance with cultural resource regulations.

During mine operation, the agencies are responsible for monitoring compliance with historic preservation and monitoring plans.

Department of Health and Environmental Sciences

Air Quality Bureau

The Air Quality Bureau of the Department of Health and Environmental Sciences (DHES) administers the Clean Air Act of Montana (Title 75, Chapter 2, MCA). Any proposed project with potential to emit more than 25 tons per year of any pollutant must obtain an air quality permit prior to construction. The applicant must apply Best Available Control Technology to each emission source.

The applicant must also demonstrate that the project would not violate Montana or Federal Ambient Air Quality Standards. The Air Quality Bureau already modified BMMI's air quality permit (#2472-02) to include the South Beal Project on February 18, 1992. Additional information about the air quality permit is on file at the Air Quality Bureau, Cogswell Building, Capitol Station, Helena, MT.

Water Quality Bureau

The Water Quality Bureau of DHES is responsible for administration of the Montana Water Quality Act (Title 75, Chapter 5, MCA), providing for the classification of surface waters, establishing surface water quality standards, and administering permit programs to control the discharge of pollutants into state waters.

Hard Rock Mining Impact Board

The Hard Rock Mining Impact Board created by the passage of the Hard Rock Impact Act (Title 89, Chapter 6, Part 3, MCA), is attached to the Montana Department of Commerce. A quasi-judicial board, it administers the Impact Act and adjudicates disputes between local government units and large-scale mineral developers over the impact mitigation plan prepared by the developer.

In the impact mitigation plan, the developer identifies the increased public sector costs associated with major mineral development and commits to pay, according to a specified time schedule, all increased capital and net operating cost to local government units resulting from development. The Hard Rock Mining Impact Board gave BMMI a waiver to the impact plan requirement on Oct. 23, 1990 (Carol Ferguson, personal communication).

C. SCOPE OF THE PROPOSED ACTION

Areas of activity include approximately 25.2 acres on the south side of upper German Gulch in the north end of the Fleecer Mountain Range. All of the proposed activity in located on National Forest System lands administered by the Butte Ranger District, Deerlodge National Forest, Silver Bow County, Montana.

The scope of the proposed action is limited to the specific alternatives identified in Chapter II of this document. The proposed action is not a general management plan for the area and this is not a programmatic EIS. This EIS was developed in compliance with the implementing regulations of the National Environmental Policy Act (NEPA) Council on Environmental Quality, Title 40, Code of Federal Regulations, part 1500-1508 (40 CFR 1500-1508) and the National Forest Management Act (NFMA), Title 36, Code of Federal Regulations, Part 219 (36 CFR 219).

DSL's rules (ARM 26.2.601 et seq.) implementing the Montana Environmental Policy Act (MEPA) (Title 75, Chapter 1, MCA) require preparation of an environmental analysis of the impacts of the project proposal and alternatives. The supplement MMRA and DSL has determined that an Environmental Impact Statement (EIS) is appropriate for this project. The purpose of this EIS is to:

Ensure that the agency uses the natural and social sciences and the environmental design arts in planning and decision-making;

Assist in the evaluation of reasonable alternatives and the development of conditions, stipulations or modifications to be made a part of a proposed action;

Examine and document the effects of a proposed action on the quality of the human environment, and provide the basis for public review and comment.

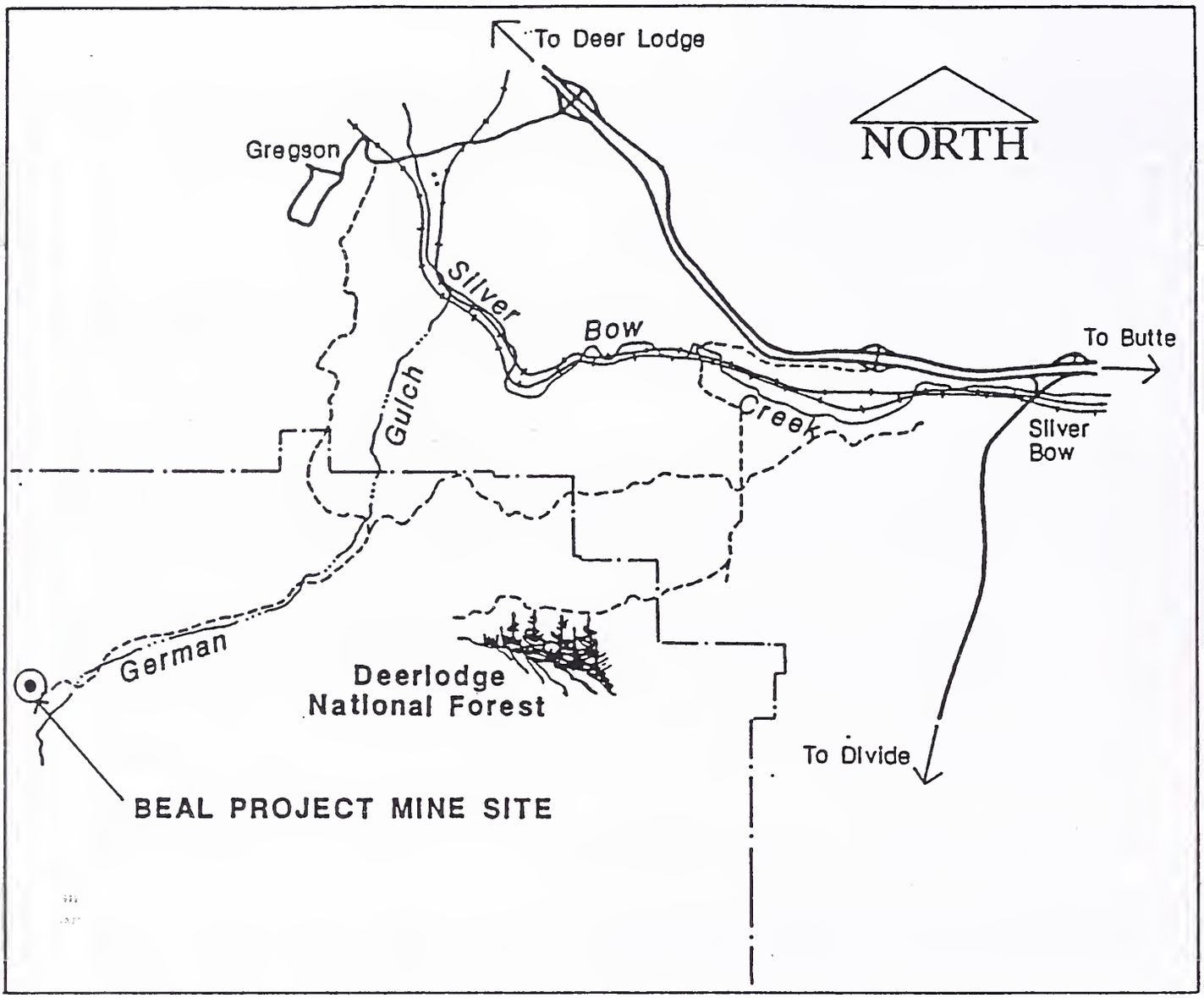
Various discussions and consequences within this document are tiered to the 1987 Deerlodge National Forest Plan and EIS. The 1988 EA is incorporated by reference at the appropriate passages throughout this document as well.

Implementation of the activities specifically identified in the alternative selected by the deciding officers in the Record of Decision can begin as soon as possible and without further NEPA documentation.

D. PURPOSE OF THIS DOCUMENT

Preparation of an Environmental Impact Statement (EIS) was determined to be necessary because the proposed action may have a significant cumulative effect on the quality of the human environment. In addition, some aspects of the cumulative effects portion of this analysis involve the agency's evaluation of impacts based on state-of-the-art methodologies - all of which are accepted in the scientific community.

This FEIS is not a decision document. It does not describe the decision to be made by the deciding officers with regard to the proposed action. This document discloses the analysis and environmental consequences associated with implementing the proposed action and alternatives to it.



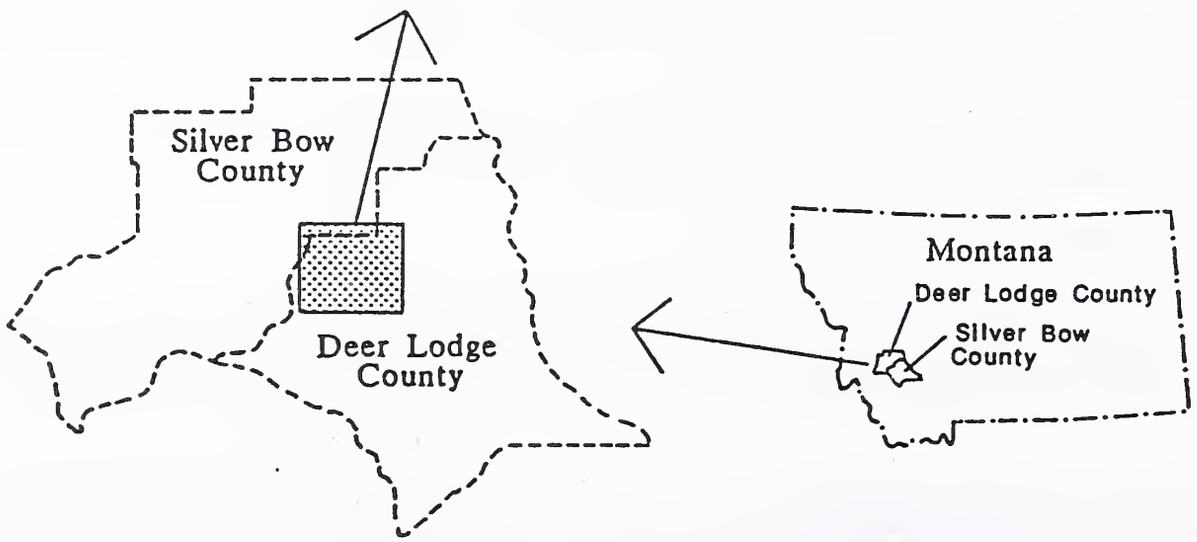


Figure 1 Location Of The Beal Mountain Project

CHANGES FROM DRAFT TO FINAL
SOUTH BEAL PROJECT EIS

CHAPTER II

Spelling corrections and editing which did not change the meaning of sentences are not identified as changes to the Draft EIS.

Changes in Chapter II include a more detailed accounting of the scoping process, additional mitigation and monitoring measures for Alternative 2, and the dismissal of several issues. The issues that were dropped include the question of the stability of the south Beal pit, the effect the South Beal ore might have on the leach pad in relationship to it's stability and the fisheries issue. The reasons why these issues were not carried through the analysis are discussed under Issues Considered but not Carried Forward.

In addition, the Summary Comparison of Alternatives which appeared as Chapter V in the Draft EIS was moved and is now located at the conclusion of Chapter II.

II - ALTERNATIVES

INTRODUCTION

This chapter summarizes the Proposed Action, the South Beal Project, and alternatives to the Proposed Action including the No Action Alternative. The first section, Alternative Development Process, contains a discussion of the scoping process, the issues and concerns raised during scoping and the issues considered but dismissed from further discussion.

The next section, Alternatives Considered in Detail, summarizes the proposal as submitted by the applicant, (Alternative 1); the proposal with mitigations proposed by the Agencies, (Alternative 2, the environmentally preferred alternative) and the no action alternative, (Alternative 3).

Alternatives Considered but Not Given Detailed Study and Comparison of Alternatives are the final two sections in the chapter.

ALTERNATIVE DEVELOPMENT PROCESS

Scoping

The scoping and public involvement process for the South Beal Project was initiated when BMMI submitted the proposal in January 1992. The DSL and USFS sought public and other agency input to help identify environmental issues and concerns. Scoping activities included holding a public meeting in Butte, Montana, on February 6, 1992, mailing letters to citizens and groups interested in activities in the project area, and soliciting written comments through a press release in the newspaper (Montana Standard, January 24, 1992). A legal notice which described the proposal was published in the Montana Standard (newspaper) for three consecutive weeks as required by DSL. The public comment period was held open until February 21, 1992. In addition to the public meeting and letters, BMMI conducted meetings with local individuals and groups to discuss the proposal and issued a news release describing the project.

BMMI re-submitted the amendment in August 1992 at which time it was determined by the agencies that an EIS would be prepared. A Notice of Intent (preparation of an EIS) was placed in the Federal Register on February 8, 1993. On March 16, 1993 a Draft EIS was issued. Notice of the release of the Draft EIS was listed in the March 26, 1993 Federal Register. The comment period concluded on May 10, 1993. Comments on the DEIS were received from the Mineral Policy Center, BMMI, the Montana office of the EPA, and the State Department of Fish Wildlife and Parks.

During the preparation of the draft, Butte Ranger District personnel contacted the state office of the EPA to review the proposal and document. A meeting in February 1993 followed at which time key EPA concerns were discussed. Following the release of the Draft a meeting was held between DSL, EPA and USFS personnel to discuss the document. A field review involving DSL, WQB, FW&P, EPA and USFS personnel was conducted at the mine site on June 2, 1993. A third meeting was held to review DSL, WQB and USFS responses to EPA's comments on the Draft EIS on June 15, 1993. The project file located at the Department of State Lands and the Butte Ranger District contains correspondence regarding the South Beal Project.

Issues and Concerns Raised in Scoping

Comments received during the public meeting and in writing were compiled and reviewed. Interdisciplinary team specialists from the DSL and USFS also raised comments and concerns during the review of the application. The issues are discussed below.

The Potential for Acid Rock Drainage

To date, elevated levels of sulfate have been detected at monitoring stations near the main Beal waste rock facility. Although the source has not been verified, there is a concern that this could be a precursor to Acid Rock Drainage (ARD). The focus of this issue is, what effects, if any, will the addition of the waste rock from the South Beal Project have on the main Beal waste rock facility in relation to levels of sulfate?

The indices of measure for this issue are: pH and fluids composition of effluent from the waste rock, and pore gas composition and interior temperature of the waste rock facility.

Ground and Surface Water Quality

Currently, some monitoring stations have had readings which exceed State Water Quality standards. Operational problems with water quality (particularly sulfates and nitrates) at BMMI indicate that nonpoint sources of degradation such as sediment, nitrate and sulfate are not controlled with the use of BMMI's existing Best Management Practices or mitigation measures. BMMI is now undertaking studies to determine the sources of nitrate and sulfate in order to identify additional management practices for control.

Specifically, would the proposed action contribute to the existing problems with sediments and concentrations of total suspended solids (TSS), total dissolved solids (TDS), nitrate, nitrite, nutrients, sulfate, and other metals?

The indices of measure for this issue will be: concentrations of the ground ans surface water parameters listed above.

Wildlife

Beal Mountain Mine has been in operation since 1988. The initial project affected approximately 450 acres of wildlife habitat. The effects ranged from removal of wildlife habitat (installation of the leach pad and related facilities) to more temporary forms of disturbance. The proposed project would expand the mine activity south of where it is presently located and involve an additional 25 acres disturbance.

Wildlife concerns specific to the proposed expansion include questions about additional habitat modification, displacement of animals, and cumulative effects in relation to the existing mine.

The indices of measure for this issue will be:

issues Considered but Dismissed From Further Discussion

Cyanide in Ground and Surface Water

How would the South Beal Project contribute to the potential for cyanide in ground and surface water? Low concentrations of cyanide have been detected in some springs and monitoring wells in the area. Concentrations reached up to .281 mg/L total cyanide in the blanket collector drain (BCD) under the heap leach in May, 1991. Total cyanide is less toxic than weak acid dissociable (WAD) cyanide or free cyanide, which are components of "total cyanide". WAD and free cyanide were only detected in effluent from the BCD, which is collected in a lined pond according to approved monitoring design. Lower concentrations of total cyanide (all less than 0.02 mg/L total CN), were detected in four springs and one monitoring well. Currently there is no maximum contaminant level for cyanide. However, the Environmental Protection Agency (EPA) Office of Drinking Water has issued a health advisory level of 0.2 mg/L free cyanide as a regulatory standard. Montana water quality criteria for acute and chronic levels of free cyanide are .022 mg/L and .0052 mg/L respectively. The source of the cyanide in the BCD was a leak in its barren pond liner in 1990 which was repaired in 1991. The concentration of cyanide in the BCD declined to below the detection limit after the leak was repaired. In May, 1992 0.015 mg/L total cyanide was detected in the BCD. This was probably due to cyanide from the liner leak still flushing from the system. The most recent samples did not contain any detectable cyanide.

BMMI has adequately addressed the issue of cyanide in ground and surface waters. Cyanide is not an issue pertinent to the permitting of South Beal. Permitting South Beal would not change the actual production rate or rate of cyanide use; and therfore cyanide in ground and surface water will not be discussed further in the document.

Cultural Resources

The South Beal Project would have no lasting visual or intrusive effect on the integrity of the historical district. Disturbances would be reclaimed. After consideration of the extent of prior cultural resource inventories, GCM Inc.'s mitigation excavation and research, and the fact that there would be no adverse effects to the National Register of Historic Places eligibility of the historical district, the project does not require any further cultural resources work and/or mitigation. The SHPO has agreed that the South Beal Project would have no adverse effect on the German Gulch Historic Mining District (Katherine M. Huppe, SHPO, letter to Richard Periman, dated April 28, 1992). A letter was sent to the Advisory Council on February 9, 1993. As standard procedure for Section 106 of the National Historic Preservation Act, the Council must be given an opportunity to comment. After receiving correspondence from the Forest Service, they concurred with the SHPO and chose not to comment.

Fisheries

The fisheries resource in German Gulch Creek, especially the westslope cutthroat trout population, was identified as a separate issue in the Draft EIS. Specific areas of concern to the fisheries resource included diversion of flow from Spring 5 and increased levels of nitrates, sulfates and TDS in surface water.

BMMI has a valid water right for water from Spring 5 which allows withdrawal of this water for off stream use. To regulate the use of this existing water right is beyond the authority of the DSL or the USFS and therefore is outside of the scope of this analysis.

The concern with increased level of nitrates, sulfates and TDS and their effect on the fisheries resource of German Gulch closely parallels the Ground and Surface Water Quality issue. Because there is not any direct disturbance of German Gulch Creek, any direct effects on the fishery resource from the South Beal Project would be realized through changes in surface water quality. The Montana Water Quality Act (MWQA) provides for protection of the beneficial uses of water, including the growth and propagation of salmonid fishes and associated aquatic life. Implementation of MWQA standards would protect these beneficial uses. The effects of the project on surface water quality are fully addressed under the Ground and Surface Water Issue.

Based on this information, it was concluded that the fisheries issue would be adequaltely addressed by the surface water issue and would not need to be carried forward in this analysis.

Land Use

The project would disturb over 25 acres of forested ground in German Gulch. The interdisciplinary team from the agencies reviewed the potential impacts to vegetation and concluded that clearing 25 plus acres of forest land would not create an impact that would alter the use of the area over time. BMMI has not proposed any changes in the previously approved post-mining land use goals. Therefore, the review team concluded the South Beal Project would not cause any cumulative land use impacts.

Seismicity

The project is located in a very low seismic area. No earthquakes have been recorded in the last 100 years that would affect the project area. Therefore, slope failure due to earthquake is not an issue.

Soil pH Effects on Revegetation

One of the questions raised in the review of the amendment was would the low pH of the soils salvaged at South Beal limit revegetation attempts as it has done on revegetation attempts in the main Beal area? In some areas of BMMI's current operation, limited success has been observed in attempts to revegetate reclaimed land surfaces.

In 1991, BMMI, in consultation with the regulatory agencies and the USDA Soil Conservation Service and representatives from Montana State University's Reclamation Research Unit, reviewed the existing revegetated acres on the mine site. Soil pH problems and possible soil amendments were discussed and seed mix modifications were suggested.

In the 1988 application, BMMI committed to soil testing to identify fertilizer recommendations. If revegetated plant communities develop plant nutrient deficiency symptoms, BMMI would take appropriate measures to correct the problem. In the proposed South Beal Project, BMMI has committed to soil sampling before soil redistribution to identify pH problems and elevated concentrations of aluminum and manganese. Based on the results of the testing, a soil amendment program would be initiated. BMMI has also proposed monitoring of revegetation success of South Beal disturbances.

Based on the proposed testing and monitoring, the agencies have concluded that there would be no cumulative impacts to the soil resources and revegetation plan as a result of the South Beal amendment.

Socioeconomic

The current workforce of 125 workers is approximately double that originally estimated in the 1988 EA/PER (Montana Department of State Lands, et al., 1988). This is due to increased production. By hiring locally within an established mining area, in-migration of workers and their families is not anticipated and no resulting impacts to local goverment services are anticipated. Therefore, increasing the number of workers is not an issue that will be carried further in the document. Approval of the south Beal Project would not increase the current work force but would provide employment for an additional year. In October 1990, the Hard Rock Impact Board informed BMMI that they were granted a full waiver and there would be no need for preparation of an impact plan.

South Beal Pit Stability

Questions concerning the competency of the South Beal pits were raised in the draft as an issue as well as questions concerning the affect of adding the South Beal ore to the leach pad because of operational stability problems in the main Beal pit. This issue was not carried forward in the FEIS because the effects were the same in all action alternatives. The effects are discussed below.

Engineering

South Beal

The extensive fracturing and weathering of the quartzite/hornfels rocks in the South Beal area make the slope potentially unstable. Excavation of the South Beal pits would create large, but relatively flat, cut slopes. These cut slopes could be susceptible to some short-term, minor erosion (1-2 years). Eroded soil would be caught within the pit, and would not reach an active stream channel. During development of the deposit, stability of the highwall may be a concern in the open pits, especially if the highwall becomes saturated. If the highwalls were to fail, a greater area may require stabilization, recontouring and revegetation. Stabilization may be more difficult with a failed slope. Small failures from isolated wet spots would not cause any long-term effects on BMMI's ability to reclaim the South Beal area.

BMMI's proposed mitigation measures should prevent any major failure of the pit highwalls. BMMI's mitigation measures include 1) snow removal before spring thaw, 2) horizontal dewatering wells drilled into the completed pit slope to reduce static water pressure, and 3) a diversion ditch constructed around the top perimeter of the pit if necessary. Mining may occur during the wet season and increase the potential for instability of the highwall if these mitigation measures are not implemented.

The change in topography from an undisturbed wooded hillside to an open pit would be a short-term impact. The pits would be backfilled and reclaimed to near original topography during the summer following ore removal. This would eliminate most erosion potential and would eliminate any long-term stability impacts associated with pit excavation.

Main Beal

The addition of approximately 1 million tons of ore on the existing heap leach pad would slightly increase the reclamation cost of the heap, but would not affect the stability of the heap. The addition of South Beal ore to the heap would bring the total mass of the heap to slightly less than 11 million tons, including main Beal ore that is yet to be mined. The heap stability analysis and design was done to allow for increased loading up to a total height of 75 feet, and total mass of 11 million tons. The addition of South Beal ore to the heap leach pad would not make the heap larger than what was designed and analyzed by the engineering consultant (Klohn Leonoff, Inc., 1992).

The waste dump size would not be increased by adding waste from the South Beal pits. The same amount of waste that would be added to the waste dump from the South Beal pits would be used from the main Beal pit to back fill the South Beal pits. The size of the waste dump would actually be decreased by mining the South Beal deposit because waste from the main Beal pit would take the place of waste and ore removed from the South Beal pits. The impact of South Beal ore on the heap would be minimal (Klohn Leonoff, Inc., 1992) and the amount of South Beal waste on the waste dump would be reduced, thereby reducing the amount of potentially reactive rock exposed to oxidation.

Features Common to All Alternatives

The USFS and the Montana Department of Fish, Wildlife and Parks will repeat baseline fish population sampling in 1993. In addition to fish population monitoring, sampling will include a species distribution survey in German Gulch Creek to document the upstream distribuation of fish populations.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative 1 - The South Beal Project

Mining Plan and Methods

The South Beal Project is designed to mine 959,840 tons of gold-bearing ore from two small open pits. BMMI would access the South Beal pits by the new main haulage road on the south side of the drainage. BMMI would build a 500-600 foot long access road from the haulage road to the pits. Ore from the South Beal deposit would be hauled uphill through the existing waste rock dump area to the coarse ore stockpile. It would then be crushed, agglomerated and truck-loaded onto the existing leach pad. The final phase of the existing leach pad that was completed in 1992 is of sufficient size to hold the South Beal ore. A cyanide solution would be used to extract the gold mineral from the ore. This amendment does not change the existing leaching process. The plan would change the permitted tonnage of ore on the heap from 10 million tons to 11 million tons.

The 10 million tons of ore originally permitted does not represent the capacity of the leach pad, but rather the mass of ore reserves contained within the main Beal ore deposit above the elevation of German Gulch at the time the original permit was issued. The 10 million ton figure is related only to the proposed pit size in the 1988 mining application, not to heap stability or liner integrity. The ultimate capacity analyzed at that time was 11 million tons piled 75 feet high.

In order for BMMI to mine the ore, 1,289,000 tons of waste rock would have to be removed from the two open pits. The waste rock from South Beal would be removed by ripping or blasting and dozing. In the initial phases of mining the South Beal deposit, waste rock would be loaded and hauled to the existing waste rock facility. At the completion of mining in the first South Beal pit, waste from the larger South Beal pit would be used to partially backfill the first South Beal pit. Remaining waste needed to completely backfill both pits would come from the main Beal pit. Total waste rock tonnage would increase from a permitted 6.4 million tons to 7.7 million tons, but the actual volume to be placed in the existing waste rock facility would not be increased.

Water saturation of the pit wall could lead to stability problems. To reduce this potential, BMMI would implement several safety measures. BMMI commits to 1) remove snow above the pit wall before spring thaw, 2) drill horizontal dewatering wells into the final pit slope before the winter of 1993-1994, and 3) construct a diversion ditch around the upgradient perimeter of the pit, if necessary. If either groundwater seepage or storm water were to become a problem in the pits during operations, an in-pit sump would be constructed and pumped. Water from this sump would be disposed of by sprinkling either on reclaimed portions of the waste rock dump or used for irrigation water during other reclamation.

In O.P. 00135, BBMI's original application (Beal Mountain Mining Inc., 1988), BMMI committed to mitigation measures to reduce impacts on air quality, hydrology, fish and wildlife and vegetation, including sediment and erosion control systems. These mitigation plans have been modified to include South Beal.

Timber Removal

The South Beal pits would be cleared of timber (25.2 acres). All merchantable timber, including sawlogs and timber suitable for posts and poles, would be sold as commercial wood products. Slash and other timber residue would be stacked and burned in compliance with the existing Burn Permit.

Soil Salvage

After timber removal, soil would be salvaged from all disturbed areas except for slopes exceeding 50 percent. The soil would be stripped to an average depth of 26 inches. Because of the generally steep slopes, soil would be salvaged by a dozer pushing soils into piles on flatter areas or pushing to constructed pick-up areas. Soil would then be loaded and hauled to the main soil stockpile and interim seeded or directly applied to recontoured areas, such as lower portions of the waste rock dump. BMMI would test soil and add any needed amendments such as lime, based on the testing. Approximately 78,000 cubic yards of soil would be stockpiled from the pit area.

Mining Schedule

The South Beal ore deposit is located on the northern exposure of German Gulch. It is in a heavily timbered area, most of which is covered by small diameter closely spaced trees. Because of a late spring season, mining is only feasible from mid-June through November.

Timber removal, soil salvage, and soil storage activities would be conducted as soon as the permit is issued. Mining would begin in the south Beal pits upon completion of these activities. The mining would be completed and backfilling and reclamation would begin in 1994. Backfilling both pits with waste rock from the main Beal pit would bring the mined-out areas back to near original contour. Reclamation would be completed in 1995.

Geochemical Characterization

Backfill material would be tested to insure it would not cause acidification of the cover soil after reclamation. The initial geochemical characterization would consist of a series of "static" tests which compare the acid generating and neutralizing capacities of individual rock samples. Each rock type within the waste would be tested separately at the rate of one representative grab sample per 50,000 tons of waste rock. Should the static testing program indicate there is a potential for acid generation, then kinetic testing of the backfill material would be required. Kinetic testing involves leaching of waste materials in humidity cells over a time period of 20 weeks or more to verify whether or not the acid generating potential of the sample will overcome the neutralizing potential over time. The static testing would determine which rock types would need to be tested.

Operational Monitoring

BMMI would continue with the water resources monitoring plan currently used at BMMI (Beal Mountain Mining, Inc., 1988), with the addition of nitrate to the indicator parameter list. The water resources monitoring plan incorporates 5 springs, 22 wells, and 11 stream monitoring stations. All stations would be sampled ten times annually-seven times a year for indicator parameters and three times a year for extended parameter analyses. Extended parameters include sampling and testing for metals. Table II-1 shows extended analysis group water quality parameters.

Table II-1: Extended Analysis Group Water Quality Parameters

METALS DETECTION LIMIT (milligrams per liter)	
Arsenic	0.001 to 0.002
Aluminum	0.03
Cadmium	0.003
Chromium	0.005
Copper	0.005
Iron	0.01
Lead	0.001
Manganese	0.0001
Mercury	0.0002
Molybdenus	0.006
Nickel	0.01
Selenium	0.002
Silver	0.005
Zinc	0.004

NUTRIENTS (milligrams per liter)	
Nitrate NO3-N	0.05
Ammonia NH3	0.10
Total Phosphorous	0.01

CYANIDE (milligrams per liter)	
Weak Acid Dissociable CN	0.005

PHYSICAL PARAMETERS AND COMMON IONS (milligrams per liter, unless otherwise noted)

Streams, Springs	
Alkalinity	10
Bicarbonate	12.2
Calcium	0.03
Carbonate	6.0
Chloride	0.5
Fluoride	0.5
Magnesium	0.04
Wells	
pH	NA
Potassium	0.05
Specific Conductance	0.5 µmhos/cm
Sodium	0.04
Sulfate	5.0
Total Dissolved Solids	10.0
Total Supended Solids (surface water only)	4.0
Hardness	1.0

One site would be monitored daily (stream monitoring station 3A, for cyanide and pH). BMMI is currently collecting data from three groundwater wells in the area of the proposed South Beal pits. One is upgradient of the proposed pits, and two are downgradient, between the proposed pits and German Gulch. These wells have been monitored since the summer of 1992 (See Figure 3).

The existing monitoring plan requires that any changes in water quality be immediately reported to the Montana Department of State Lands. Also, monitoring frequency at seven wells and three springs would increase if any cyanide is detected in the blanket drain beneath the leach pad.

Reclamation Plan

Pits: After mining, the southwest pit would be partially backfilled with waste rock from the larger southeast pit. The southeast pit would not be completely backfilled at that time to allow haul road access through the pit. Once the southeast pit is mined out, both pits would be backfilled in 25-foot lifts with waste rock from the main Beal pit. Backfill would be contoured to blend with adjacent undisturbed ground. The estimated volume of backfill to achieve designed post-operation topography is 1,031,600 loose cubic years (lcy). Post-reclamation land use of the South Beal area would be primarily wildlife habitat with site conditions suitable for development of a forest resource.

Heap: BMMI's reclamation techniques, methods, and commitments from the original 1988 Beal reclamation plan would remain essentially unchanged. After the heap cyanide is neutralized, excess process water would be disposed of by land application on permitted land application disposal sites (Figure 3). The liner would be perforated, the entire pad area covered with 20 or more inches of soil, and revegetated. The only changes in the ore pad with the addition of the South Beal ore would be slight additional height increases and possible minor modification to the final drainage pattern.

BMMI has committed to institute mitigation measures if the heap ultimately produces acid drainage (Beal Mountain Mining, Inc., 1992a). Mitigation measures could include such things as 1) controlling the amount of water entering and seeping through the heap through the addition of a cap of non acid-forming or alkaline material, 2) adding neutralizing capacity to the system by adding lime or phosphate rock, or 3) collection and treatment of seepage from the heap.

Waste Approximately 100,000 tons of potentially acid-neutralizing marble waste rock would be removed from the South Beal pits and stockpiled for capping of any areas with potentialy acid producing rocks at the end of mining.

Waste rock used for haul road construction and for surface materials in the backfilled pits would be sampled for acid-base balance to ensure that acidification of soil does not occur.

In-pit roads would be eliminated through backfilling. The proposed 500-600 foot long haul road connecting the existing haul road to the South Beal pits would be reclaimed after pit backfilling. Reclamation of the road would consist of regrading the road cut to its approximate original contour, soil distribution, testing of backfilled material, and revegetation (See Figure 1).

Reclamation Monitoring

BMMI would monitor revegetation, soils, and water resources to determine success and evaluate modifications to the reclamation plan if necessary. BMMI's proposed water monitoring plan is to monitor 8 wells, 2 springs, and 3 surface water stations twice a year for the parametersl listed in Table II-1. BMMI would monitor surface water control structures.

Alternative 2, The South Beal Project with Modifications

Modifications recommended by the agencies to BMMI's proposal include mitigating measures designed to reduce or eliminate environmental impacts not adequately addressed by BMMI and to increase company coordination with the agencies. The following modifications would be incorporated by the agencies as stipulations to the permit if this alternative were selected by the decision-makers. All other aspects of BMMI's proposal would remain the same.

Ground and Surface Water

1) In order to reduce water infiltration into the waste rock facility, BMMI would not dispose of water from the South Beal pit sump onto the waste rock dump or use it for irrigation water. This water would be either returned to the processing circuit, used for dust suppression or treated by land application disposal or other appropriate methods. BMMI would sample pit sump water for extended analysis parameters (see Table II-1) prior to use for dust suppression or land application.

2) In order to analyse water quality trends in a more timely fashion during operation, BMMI would submit water quality monitoring reports from the South Beal upgradient and downgradient monitoring wells SBMW-1, -2 and-3: from surface water stations 3, 3a, and 4, and Spring 5; and from Blanket Collector Drains BCD and BCD-A to the DSL and USFS monthly during the mining of South Beal. (See Figure 3). The reports would be submitted in hard copy and in electronic format compatible with the STORET database, in order to facilitate independent trend analysis of the data. All monitoring data would be submitted quarterly, in the same format used for South Beal monitoring. BMMI would monitor the two downgradient South Beal wells until long-term prevention of water quality degradation is assured.

3) To minimize short and long term water quality impacts, BMMI would consult with the agencies to field review Best Management Practices (BMPs) prior to ground disturbance. BMMI has applied for a storm water permit, which would include the development of site specific BMPs and a storm water pollution prevention plan. In addition to the BMPs included in the stormwater permit, BMMI would implement the following BMPs for preservation of water quality:

a. BMMI would adjust fertilizer and mulch application practices to minimize nitrate and sulfate concentrations in runoff from reclaimed areas.

b. BMMI would minimize nitrate release by using BMPs which would include 1) a redundant blast initiation system, 2) monitoring blasts to ensure minimal amounts of explosives are used, 3) preventing, recording and cleaning up ANFO spillage, and 4) by ongoing training of mine and contract personnel.

c. BMMI would submit details of South Beal surface water drainage plans to the agencies for approval prior to final reclamation.

d. BMMI would install appropriate sediment control structures prior to ground disturbance.

e. In order to assure water quality standards are met in the long term, BBMI would be required to reevaluate sedimentation to German Gulch, as a result of ongoing construction activities, in the form of a survey for cobble embeddedness and percent fine sediment in German Gulch.

4) BMMI would not perforate the liner under the heap before reclamation begins. BMMI would install horizontal dewatering wells into the low points in the collection sumps to prevent water build-up or would propose another plan that is equally effective in lowering the phreatic surface under the heap. Under the proposed post-operational monitoring plan BMMI would be required to monitor water quality until it is assured that appropriate Montana Water Quality Standards, can be met in the long-term. The standards which must be met include, but are not limited to, maximum contaminant levels (MCLs) for nitrates, sulfates, arsenic, selenium and pH.

5) BMMI would implement an aquatic biological monitoring program to assess the sites potentially affected by the mine. Since aquatic communities are dynamic in nature and are affected by environmental factors not related to mine activities, the site would be evaluated relative to instream control points or reference streams. The suitability of a reference stream would be evaluated by seven habitat criteria: 1. flow, 2. gradient, 3. elevation, 4. substrate composition, 5. aspect, 6. vegetative cover (canopy), and 7. major ion chemistry

Station 4 on upper German Gulch was originally selected for a water quality control site, however, due to elevated nitrate in ground water in the vicinity and sediment from various sources, this location cannot be used as a control site. Other possible locations for a control sites include Edward Gulch, Greenland Gulch, Beefstraight Creek, or Norton Creek.

During the first year of collection, periphyton and aquatic macroinvertebrate samples would be collected in the spring (April), summer (July-August) and fall (September-October). Standard procedures for field and laboratory methods would be employed for macroinvertebrates (EPA, 1990), periphyton community composition (Bahls, 1993) and biomass (USGS, 1987) collection and analysis. In addition to standard statistical analyses, data would be evaluated based on standard community metrics, such as, species richness, species composition, EPT: Chironomide, Hilsenhoff, and other measures of biological integrity (EPA, 1989). When appropriate, results would be compared to pre-mining conditions.

After the first complete year of biological sampling, BMMI and the agencies would determine the suitability of reference sites, sampling protocols and analytical procedures. Timing and the level of analysis may be adjusted onthe basis of knowledge gained during the first year of analysis. Biological monitoring would continue for the life-of-mine.

Biological monitoring would be conducted at three locations in German Gulch. One station would be located in the vicinity of Stations 3 and 3A; the second would be located in the vicinity of Stations 2 and 2A; and the final site would be a suitable control site.

6) BBMI would monitor the interior of the waste rock facility to help determine potential sources for the existing sulfate concentrations in spring-5. If monitoring of the waste facility indicates oxidation of iron disulfide as a source of sulfate, BMMI would be required to implement a waste segregation program immediately. BMMI would stockpile South Beal neutral waste as well as main Beal neutral waste, and use it for capping the waste rock facility, the backfilled South Beal pit, and possibly the heap leach pad if appropriate. BMMI would test its proposed main Beal test capping sequence to evaluate the effectiveness of capping layers to limit infiltration. BMMI would implement kinetic testing or field test plots as determined appropriate by the agencies.

7) If water quality parameters continue to deteriorate, BBMI would segregate waste and blend lime into the higher sulfide waste rock. If appropriate, BBMI would cap the waste rock facility with an effective capping sequence to prevent infiltration into the waste rock facility.

8) BMMI would consult with the agencies including Montana Department of Fish, Wildlife and Parks (MDFWP), prior to further diversions of water from German Gulch.

Engineering

9) BMMI would use the specifications described in O.P. 00135, the main Beal application, for diversion structures around the heap and the waste rock facility to maintain pit stability in the long term. BMMI would design and install outlet structures for the release of the diversion water (BMMI 1988, Vol. 1, Pg 3-54-b). BMMI would line the surface water diversion ditches in the area of the Gully fault with appropriate impermeable liners to minimize seepage during final reclamation.

10) BMMI would continue to pump dewatering wells in the main Beal pit until stability of the heap is no longer an issue and a failure of the heap would not adversely affect water quality (BMMI 1988, Vol.1, pg 3-61).

South Beal Water Quality Maintenance Plan Trigger/Action Levels

11) The intent of this stipulation is to provide assurace that the South Beal project will not compound the water quality degradation problems associated with the Main Beal operation. The intent of this plan is not to allow the degradation of German Gulch. Remediation of water quality impacts currently associated with Mail Beal operation would be pursued separately from the South Beal permit. Current degradation has resulted in elevated nitrate and selenium concentrations which have already triggered source investigations. Therefore the interim trigger levels in table II-2, which are intended to prevent further degradation, are higher than certain criteria in column 4, "Protected Criteria". The "trigger levels" in this plan would be revised as current water quality impacts are eliminated, to provide further assurance that the South Beal project does not contribute to degradation.

Table II-2. German Gulch Trigger Levels

Parameter	Trigger	1992 average/high conditions (STA-3)	Protected Criteria
NO3+NO2 as N	2.0 mg/l	3.37 mg/l (average)5.3 mg/l(high)	1.0 mg/L total has been recommended as preventative of nuisance algal growth in certain streams; no appropriate NO3 has been established for German Gulch. The nitrate MCL is 10 mg/l.
SO4	200 mg/l	116.7 mg/l (av.)159 mg/l (high)	250 mg/l secondary MCL; B-1 stream classification
TDS	400 mg/l	260 mg/l (average)367 mg/l (high)	500 mg/l secondary MCL; B-1 stream classification
pH	<6.5 or>8.5	7.88 (av);range: 7.76 to 8.03	secondary MCL; B-1 stream classification
Cu(TRC)	0.025 mg/l	0.006 mg/l (av); 0.008 mg/l high	Approx. chronic aquatic life criteria (based on hardness of 240 mg/l at STA-3)
As (TRC)	0.025 mg/l	0.014 mg/l (av.); 0.018 mg/l (high)	1/2 primary MCL (0.05 mg/l)
Se (TRC)	0.025 mg/l	0.020 mg/l (av.); 0.027 mg/l (high)	1/2 current federal primary MCL of 0.05 mg/l (Montana MCL is 0.01 mg/l based on 1986 federal criteria).

Effluent from springs 5 and 3 must be collected and diverted if Maximum Contaminant Levels (MCLs) are exceeded at these sampling sites. Further actions must be taken if downstream water quality exceeds certain trigger levels identified in Table II-2. These conditions must be met at surface water monitoring site STA-3, and at all downstream monitoring stations.

Because of recent water quality changes in German Gulch and uncertainty of the causes of this degradation, the agencies are requiring, by stipulation to the operating permit, that certain concentration limits be set for German Gulch surface water. The intention of these limits is to prevent further degradation of surface water. These limits are protective of human health and aquatic life criteria. BBMI would be required to meet these limits until or unless they are superseded by effluent limits imposed by an MPDES permit. If these restrictions remain in effect, BBMI would be required to remediate impacts to German Gulch water quality over time. In 1995, in-stream concentration limits would be reduced to 150 mg/l for sulfate, 300 mg/l for TDS, 1.0 mg/l for nitrate, and 0.1 mg/l for selenium. In 1998 this would be further reduced to 100 mg/l for sulfate, 250 mg/l for TDS, 0.8 mg/l for nitrate, and 0.006 mg/l for selenium.

Copper and arsenic concentrations in the range of the trigger levels were occassionally detected during baseline data collection; such occurrences can be anticipated in mineralized areas. Baseline selenium concentrations were in the 0.004 mg/l range. Baseline sulfate and TDS concentrations at STA-3 averaged 32 mg/l and 122 mg/l, respectively. A baseline concentration of 0.89 mg/l nitrate + nitrate as N was reported at STA-3 in September 1987. Subsequent baseline nitrate samples for nitrate were less than the detection limit of 0.05 mg/l; therefore, the average baseline concentrations would be 0.24 mg/l. However, all baseline samples were collected during autumn months, in 1987 and 1988. More recent data collection has suggested that nitrate concentrations are higher in the springtime.

If a trigger level is exceeded, BMMI must immediately notify the DSL and DNF in writing and must re-sample the affected site, as well as the immediate upstream and downstream monitoring stations. These samples must be submitted to the laboratory on a rushed analysis schedule, and the results sent to the agencies.

If any of these follow-up samples also exceed the trigger levels, then the following actions must commence.

a. All water from upstream degraded springs will be diverted, to channels of appropriate size, and either treated, used in the processing circuit, or land applied.

b. Sampling will be conducted weekly until water quality returns to within allowed limits for three consecutive weeks.

c. If a trigger level is exceeded at a site for a six week period, synoptic sampling will be conducted upstream to identify sources of degradation. DSL and DNF representatives will be provided opportunity to participate in this sampling.

d. Source control measures will be implemented. BMMI must propose appropriate source control measures within two weeks of receipt of synoptic sampling results. Appropriate measures may include, but are not limited to: spring diversion, source reclamation or capping, source removal, and installation of recovery wells.

e. If exceedance of water quality limits cannot be remedied and concentrations of parameters of concern continue to rise, BMMI must meet with the agencies to determine appropriate courses for further actions.

f. If deemed necessary, these actions may include suspension or complete treatment of German Gulch water.

Alternative 3, The No Action Alternative

The Beal Mountain Mine would remain in operation as currently permitted. The currently permitted operating plan is on file with the agencies. The environmental effects of BMMI's current operating plan and road were previously analyzed in an EA dated July, 1988 and in an EA dated August 14, 1992. The conclusions drawn in these documents are still valid.

COMPARISON OF ALTERNATIVES

This section presents a summary of environmental effects for each identified issue. More detail is found in Chapter IV-Environmental Effects.

Potential for Acid Rock Drainage

What is the potential for the waste material from the South Beal to contirbute to elevated levels of sulfate detected from monitoring stations near the Main Beal waste rock facility?

The rocks associated with the South Beal deposit contain some sulfides, including iron disulfides, so there is some potential for contaminant leaching to occur. However, it is not expected to occur for three principal reasons:

1. The neutralizing material which should buffer any acidic waters which filter through it,

2. The South Beal pit will be sequentially backfilled and capped, if necessary, to reduce infiltrations, and

3. Backfill material will be tested to assure that acidification of the revegetated soil layer does not occur.

Successful reclamation of the South Beal pit area will decrease oxygen diffusion into the backfilled pit and will increase evapotranspiration which subsequently reduces infiltrations and seepage.

Kinetic testing for mail Beal waste did not commence until May of 1993. Therefore, conclusions as to whether or not main Beal waste will produce contaminated leachate still cannot be made with certainty. In Alternative 1, BMMI has proposed a rock monitoring program which would allow the company and the agencies to better characterize waste from the main Beal deposit, as well as the South Beal deposit. BMMI has committed to address any concerns if the spent ore on the leach produces contaminated leachate (Beal Mountain Mining, Inc., 1992).

For Alternative 2, BMMI must monitor the interior of the waste rock facility to help distinguish potential sources for the existing sulfate concentrations. The indices of measure will be pH, pore gas composition, fluids composition, and interior temperature for the waste rock facility and static and kinetic test results. BMMI would also implement additional testing if the agencies determine it is necessary. The agencies would have more data to predict and define the potential for contaminant leaching. BMMI will not be allowed to perforate the leach pad liner until protection of water quality can be assured.

For all alternatives, if oxidation of iron disulfides is found to be occurring in any mine facility BMMI will be required, if appropriate, to cap the facility at closure.

If Alternative 3 is selected, BMMI's commitment to address acid rock drainage from the heap would not be included in the operating permit. However, the existing reclamation plan can be revised pursuant to Title 82-4-337, MCA. Also, if acid rock drainage were to develop , the marble waste rock from the South Beal waste rock would not be available to cap reactive rock from main Beal pit area. However, other neutral material could be used from unmineralized areas within the permit boundary to cap reactive rock. Any possibility for contaminated leachate from South Beal ore or waste rock would be eliminated if Alternative 3 were selected.

Ground and Surface Water Quality

Would the proposed action affect ground and surface water quantity - particularly as evidenced by sediment, concentrations of total dissolved solids, total suspended solids, nitrate, nitrite, nutrients, sulfate and other metals?

Diversion of water from German Gulch is allowed by BMMI's 1 cubic foot/second water right. Discharge from Spring 3 and 5 comprised approximately 20 to 30 percent of flow in upper German Gulch (above the confluences with tributaries Greenland Gulch and Edward Creek). The proposed action would not affect water quantity because spring diversion is not related to the South Beal Project. Diversion of springs is related to the existing mining operation.

Impacts to ground water from implementation of Alternative 1 and 2 are expected to be minimal. For Alternative 2, beneficial uses are expected to be protected.

If current ongoing corrective actions are not effective, implementation of Alternative 1 may result in continued increases of nitrate and sulfate concentrations, but the rate of change would not be expected to accelerate. If Alternative 1 were selected, BMMI would submit water quality monitoring results from South Beal annually along with water monitoring reports from the main Beal operation. Alternative 2, the South Beal Project with modifications, proposes that water quality monitoring reports would be supplied to the agencies monthly. This would increase agency and company oversight of water quality concerns and allow the agencies and company to take action during the mining of the South Beal deposit if water quality problems develop.

BMMI has committed to BMPs to control erosion and sedimentation at both the main Beal pit and the South Beal pits. The agencies included several BMPs for controlling nitrate in Alternative 2, the South Beal Project with modifications. Nitrate concentrations in German Gulch have decreased since spring diversion was initiated. If Alternative 3, the no action alternative, is selected, the agencies will evaluate BMMI's BMPs this field season and, if warranted, will modify BMMI's permit to improve the effectivenss of BMPs.

In cases were numerical criteria are not available, such as sediment, impacts to beneficial uses are assessed through monitoring of instream biological (plant and invertebrate) communities. Alternative 2 provides for biological monitoring of German Gulch so changes in abundance, community structure and function, reduction of taxa and dominance of the aquatic community by a few taxa, can be used as the indices of the degree of impairment of these beneficial uses.

If Alternative 3 is chosen, no biological monitoring would be requied under the existing permit. However, through the review process pursuant to Titel 82-4-337 (MCA) the Department of State Lands has the authority to request changes to the mine's operating and reclamation plans.

Wildlife

Wildlife concerns specific to the implementation of the South Beal Project include questions about additional habitat modification, displacement of animals, and cumulative effects with existing mining disturbance.

All alternatives would have short-term effects on wildlife habitat and wildlife.

Comparison of Disturbances for Alternatives 1, 2, and 3

Disturbance	Alternatives 1 & 2	Alternative 3 No Action
Road Length	500-600 feet	No Change
Permit Area	1202.2 Acres	1202.2 Acres
Total Disturbance	450 Acres	425 Acres

CHANGES FROM DRAFT TO FINAL
SOUTH BEAL PROJECT EIS

CHAPTER III

Spelling corrections and editing which did not change the meaning of sentences are not identified as changes to the Draft EIS.

The changes in Chapter III included general editing and clarification. Specific changes were made as follows:

Geology-Main Beal

Additional information is given about movement of a major slump in a portion of the highwall in the Main Beal pit and monitoring controls.

Surface Water

Data for 1992 TDS at Station 2a were changed from 227 to 301 mg/L. One sentence was added: "According to the Hydrometrics annual water monitoring summary, low flows in 1992 may account for nearly all reported increases in that year". Additional information and clarification is found under the Water Quality - Nitrate Concentrations discussion.

III - EXISTING ENVIRONMENT

INTRODUCTION

This chapter describes the existing environment. Additional detail may be found for some resources in Operating Permit 00135 (O.P. 00135), main Beal operating permit application (Beal Mountain Mining Inc., 1988) and the 1988 EA/PER (Montana Department of State Lands et al, 1988).

Deerlodge National Forest Plan

The proposed South Beal Project is located entirely within National Forest System lands administered by the Deerlodge National Forest (DNF). The general management direction for the DNF is found in the 1987 Forest Plan, (U.S. Forest Service, 1987) on file at the DNF Supervisor's Office in Butte. This document provides Forest-wide goals and objectives (p.II-1-5), and goals and standards for sub-units of the Forest referred to as Management Areas (MAs). The following discussion highlights those Forest-wide goals and objectives, management area goals and standards relevant to the proposed action are also addressed in this EIS.

One of the goals of the Deerlodge Forest Plan is to facilitate development of mineral resources (p. II-1). The objective for minerals is that lands will be managed to maintain reasonable levels of availability and accessibility. The effects of surface, renewable resource activities and allocations on minerals exploration and development will be considered for each plan of operation or lease submitted (p. II-4).

Applicable Forest-wide standards for minerals include: (1) Develop realistic operating plans and operating conditions on all mineral activities. (2) Promote access to and orderly development of needed mineral commodities. Interdisciplinary review of plan proposals will consider area management objectives and area transportation plans (p. II-31).

Appendix N of the Deerlodge Forest Plan contains Hunting Recreation Opportunity Objectives for specific geographic areas. The Beal Mountain Mine is located within the High Rye Elk Hunting Recreation Opportunity Geographic Area (EHROGA). This 28,000 acre area is roaded and lightly developed. The maximum open road density is 0.5 mi/ sq. mi., the minimum hiding cover is 36 percent and the elk effective cover is to be maintained at or above 70 percent. The Hunting Recreation Opportunity Objective for this area is to provide for walk-in hunting opportunities. Motorized access will be permitted on a few roads within the area. Game retrieval distance will vary from 0-3 miles. The challenge and risk will vary from low to moderate. (p. N-7).

Chapter III of the Deerlodge Forest Plan describes Management Areas (MA) including goals, land management direction to achieve the Forest-wide goals, objectives and standards found in Chapter II of the Plan. The proposed action is located in Management Areas E-1 and A-6.

MAs E-1 and A-6

The majority of the proposed action, 87 percent, is on 21.9 acres within MA E-1, which consists of productive forest land containing stands of Douglas fir, lodgepole pine, subalpine fir and spruce. Most areas are on slopes less than 40 percent. MA E-1 may contain inclusions of nonforest lands and lands of low productivity. The goal in this area is to provide healthy stands of timber and economic levels of timber while maintaining overall levels of wildlife habitat, livestock grazing and dispersed recreation. The standards for locatable mineral development include: (1) Mineral-related operations will be according to approved operating plans. Conditions and stipulations will maintain timber production to the extent practical. (2) Access requests will be evaluated and allowed on a case-by-case basis. Part of the evaluation will consider needs and will be dependent on whether or not it can be demonstrated that such access is the next logical step beyond the existing exploration and/or developmental stage. Such access will be coordinated with and incorporated into the area transportation plan. Final reclamation of all roads not needed for future management will be to near natural conditions (p. III-54, 55).

The lower, northeast edge of the proposed pit, 13 percent of the project, is on 3.3 acres within MA A-6, which consists of nonforest and forested land where timber management and range or wildlife improvements are currently uneconomical or environmentally infeasible. Often included are areas which are steep and rocky, have poor accessibility, or are low in productivity. The goals in this area are to preserve the areas' present condition with minimal investment for resource activities consistent with protection of basic soil, water, and wildlife resources; and to permit activities necessary to meet the management direction of adjacent management areas. Standards for locatable mineral development include: (1) Encourage use of low impact (geochemical, geophysical) prospecting methods. (2) Access requests requiring dirt moving will be evaluated and allowed on a case-by-case basis. Part of the evaluation will consider needs and will be dependent on whether or not it can be demonstrated that such access is the next logical step beyond the existing exploration and/or development stage. Such access will be coordinated with and incorporated into the area transportation plan. (3) Final reclamation will include closing and restoring roads not needed for access to adjacent management areas to near natural conditions (p. III-14, 15).

GEOLOGY AND ENGINEERING

Geology

The geology of the main Beal deposit was described in detail in the 1988 EA/PER and most recently in a paper presented by Eric Fier, Beal Mountain Mine's Chief Mine Geologist, at the 98th Annual Northwest Mining Association Convention in December of 1992 (Fier, 1992). The host rocks for the South Beal deposit are a calcareous impure quartzite and a dense, chalky white, impure calc-silicate marble. The deposit is in a single bed about 32 feet thick and dipping 15 to 20 degrees northeast, almost paralleling the north-facing hillside slope. The South Beal host and country rocks have been metamorphosed. The metamorphic assemblage of biotite, diopside, potassium feldspar, chlorite, scapolite, quartz, actinolite-tremolite and hornblende is similar to the assemblage at the main Beal deposit.

Igneous rocks within and peripheral to the deposit include diorite and granodiorite. A diorite stock is located 200 to 300 feet southwest of the deposit. This rock is the same as the stock located on the western side of the main Beal deposit. Coarse-grained, equigranular granodiorite is located 3000 feet east of the deposit. This is the same granodiorite located 2500 feet east of the Beal deposit, and is considered to be part of the Boulder Batholith.

Major geologic structures in the mine area include the German Gulch fault, the Beal shear, the Gully fault located in the highwall of the main Beal pit, an unnamed bedding plane on which significant movement has recently occurred, and northwest trending normal faults (Figure 3.1). The South Beal deposit is extensively fractured in a predominantly east-west direction with secondary north-south patterns. This is consistent with the fractures at the main Beal deposit. For the South Beal deposit only minor east-west shearing was field mapped but extensive fracturing has occurred. A northwest trending normal fault is located on the east side of the deposit. Displacement is unknown, but the fault does not appear to displace gold mineralization.

Engineering

South Beal

The South Beal deposit is located on the north-facing slope of German Gulch, east of Mt. Haggin, in the eastern portion of the Pintler Range. The slope of the hillside ranges from 25 to 60 percent. Stratigraphic units in this area dip in the same direction as the surface slope. Some minor creeping occurs on the hillside. This creates some minor changes in the existing topography and somewhat reduces the natural stability of the surface and sub-surface material. The marble is only slightly fractured and has good strength. The quartzite hornfels rock is highly fractured, 95 percent of the rock is broken into small pieces and is held together with soft clay. The extensive fracturing and weathering of the rock in the South Beal area make the slope potentially unstable.

Main Beal

The main Beal deposit is located on the south facing slope of German Gulch. In the highwall of the existing pit is a northwest trending normal fault, the Gully fault or shear zone (Figure 3.1), which trends just south of the southwest corner of the leach pad. Another important geologic feature is an unnamed bedding plane which dips to the northeast. In May of 1992, movement was noted which has produced a major slump of a portion of the highwall in the direction of the existing pit.

The slump block seems to be bound on the east by the Gully fault. BMMI has buttressed the slump block and is currently dewatering the highwall with horizontal drains. After a stability analysis was conducted (Klohn, Leonoff, 1992), BMMI reconfigured the heap leach pad to avoid a known part of the Gully fault shear zone. Since the recommended dewatering of the pit highwall was initiated, movement on the bedding plane has slowed. During the winter, movement ceases. During spring runoff, movement is less than 0.2 ft/day (per comm. Eric Fier, 5-21-93). BMMI currently monitors movement daily by surveying and measuring movement of surveyed control monuments (Figure 3.1).

The existing reconfigured heap leach pad currently holds 7.1 million tons of gold bearing ore heaped on it (personal communication with Tad Dale of BMMI on 2/19/93). The heap top is relatively flat and the sides benched with the slope between the 15 foot high, 8 foot wide benches at 1.5:1. The overall slopes of the sides vary from 2:1 to 2.5:1. BMMI is using a dilute cyanide solution to extract the gold from the heaped ore.

HYDROLOGY

Ground Water

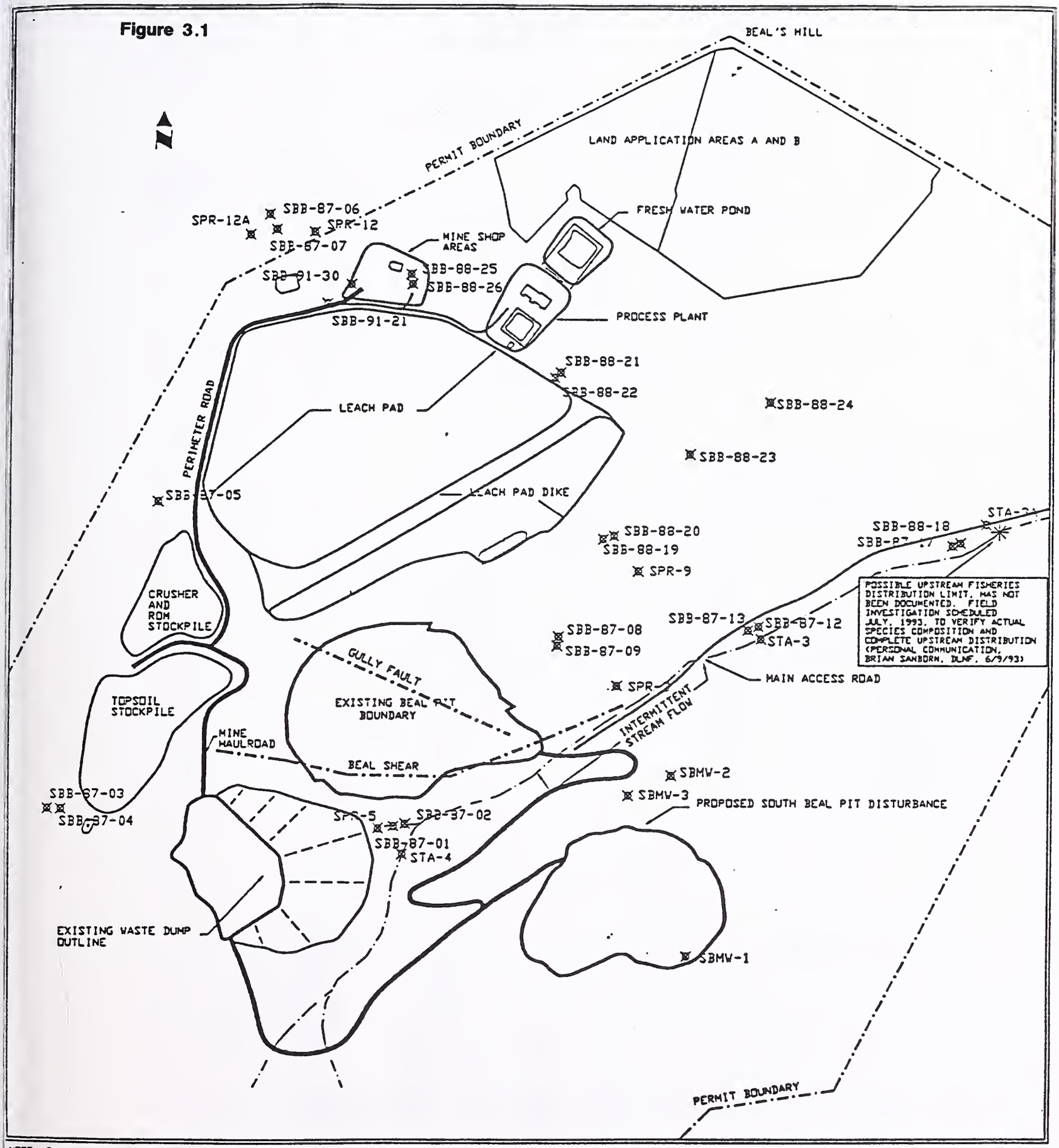
Extensive exploratory drilling in the proposed South Beal pit area shows that the water table is located 25 to 50 feet deeper than the proposed pit floors. Water samples taken from drill holes SBP 1 and SBP 2 indicate that existing ground water quality in this area is good. The ground water is classified as Class I, suitable for public and private water supplies, culinary and food processing purposes, irrigation, livestock and wildlife watering, and for commercial and industrial purposes with little or no treatment. Several metals were detected in water samples from these drill holes and monitoring wells, but concentrations did not exceed maximum contaminant levels (MCLs). MCLs are standards designed to protect present and future beneficial uses of ground water. Zinc and copper do not have ground water standards, but do have aquatic standards, which are not exceeded by South Beal groundwater.

Surface Water

No springs or streams are known to exist on the south side of German Gulch which would be impacted by the proposed South Beal pits. The only surface water which could potentially be impacted by this amendment would be German Gulch. German Gulch water quality is generally good and is classified as B-1, suitable for drinking, culinary and food processing purposes, after conventional treatment; and is suitable for bathing, swimming, and recreation, growth and propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers and agricultural and industrial water supply.

Surface water quality in German Gulch has changed since baseline data were collected in 1987 and 1988 for the main Beal mine (Figures 3.1 through 3.11). Thirty-three water quality parameters are monitored. The only water quality parameters which have changed considerably at the surface water monitoring stations are total dissolved solids (TDS), sulfates, and nitrates. Concentrations of TDS in German Gulch in the reach from directly below the operation (Station 3A) to Station 2A (approximately one mile downstream of Station 3A) have doubled since baseline data were collected. TDS at Station 2A have risen from an average of 136 ppm at the beginning of operations in 1988 to a high of 253 mg/L in July of 1992. Increases in TDS are related to the waste rock facility. According to the Hydrometrics annual water monitoring summary, low flows in 1992 may account for nearly all the reported increases in that year (Beal Mountain Mining Inc. 1992c). Montana's water quality standard for TDS in drinking water is 500 mg/L.

Figure 3.1



NOTE: Original baseline indicated that the Fishery was identified somewhere between stations 2A and 3A

Monitoring Stations

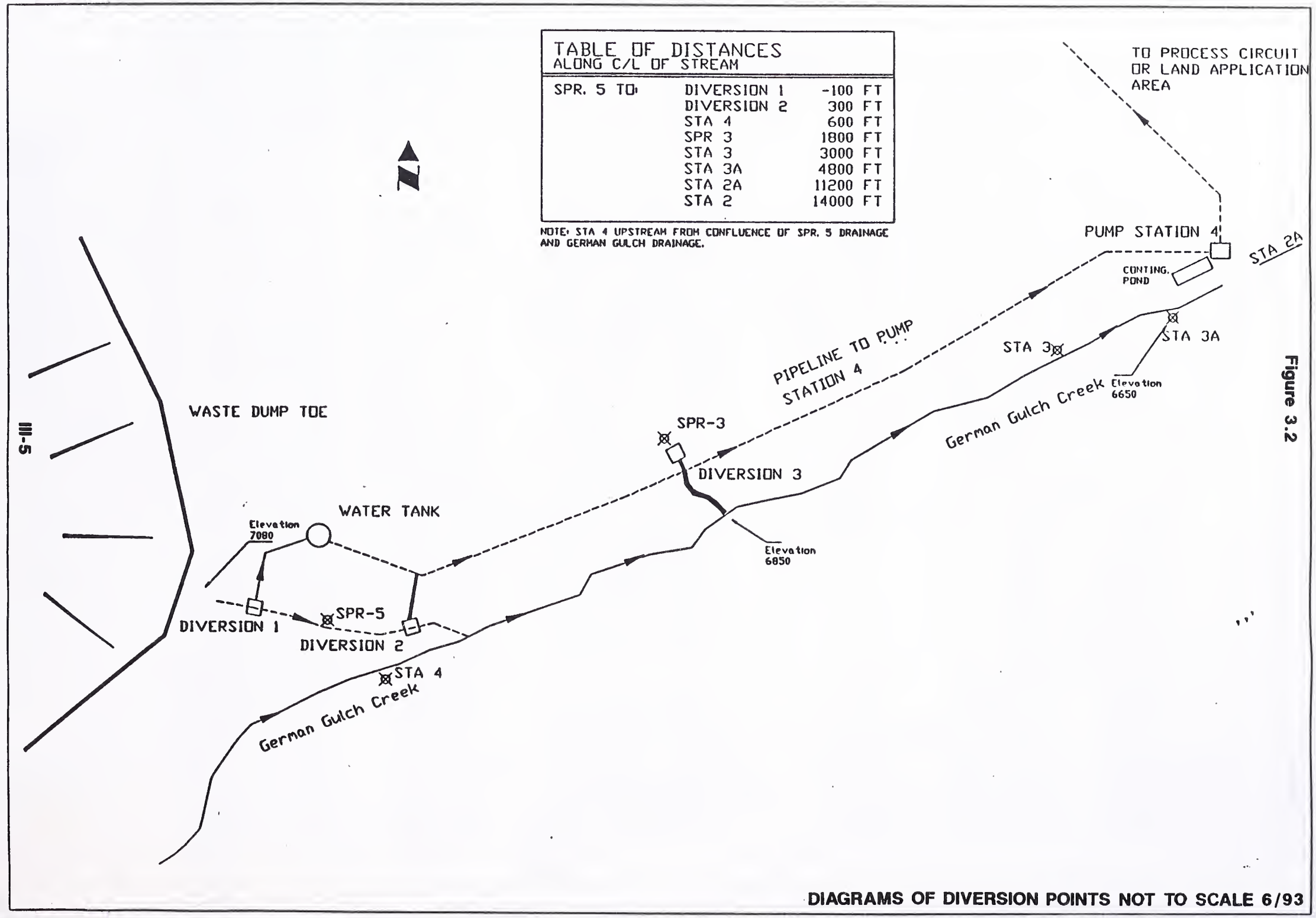


Figure 3.2

DIAGRAMS OF DIVERSION POINTS NOT TO SCALE 6/93

File: SB0002.DWG - 6/93

Figure 3.3

GROUNDWATER MONITORING WELLS
BEAL MOUNTAIN MINING, INC.

Station Number (1) SBB-	Perforated Interval (feet)	Aquifer	Mine Facility Monitored
87-01	7-27	Alluvium	Waste rock dump
87-02	64-104	Bedrock	Waste rock dump
87-04	100-140	Bedrock	Waste rock dump (upgradient)
87-05	8-25	Colluvium	Leach pad
87-06	80-120	Bedrock	Leach pad, processing area
87-07	18-38	Colluvium	Leach pad, processing area
87-08	3-11	Colluvium	Leach pad
87-09	100-140	Bedrock	Leach pad
87-12	100-140	Bedrock	All facilities
87-13	12-17	Alluvium	All facilities
88-17	15-30	Alluvium	All facilities
88-18	40-60	Bedrock	All facilities
88-19	10-25	Colluvium	Leach pad
88-20	50-70	Bedrock	Leach pad
88-21	7-22	Colluvium	Processing area
88-22	45-65	Bedrock	Processing area
88-23	10-30	Bedrock	Leach pad, processing area
88-24	10-30	Bedrock	Processing area
88-25	20-35	Colluvium	Processing area
88-26	50-70	Bedrock	Processing area
91-29*	40-60	Colluvium	Leach pad, processing area
91-30*	20-30	Colluvium	Leach pad, processing area
SBMW-1**	20-30	Bedrock	South Beal (upgradient)

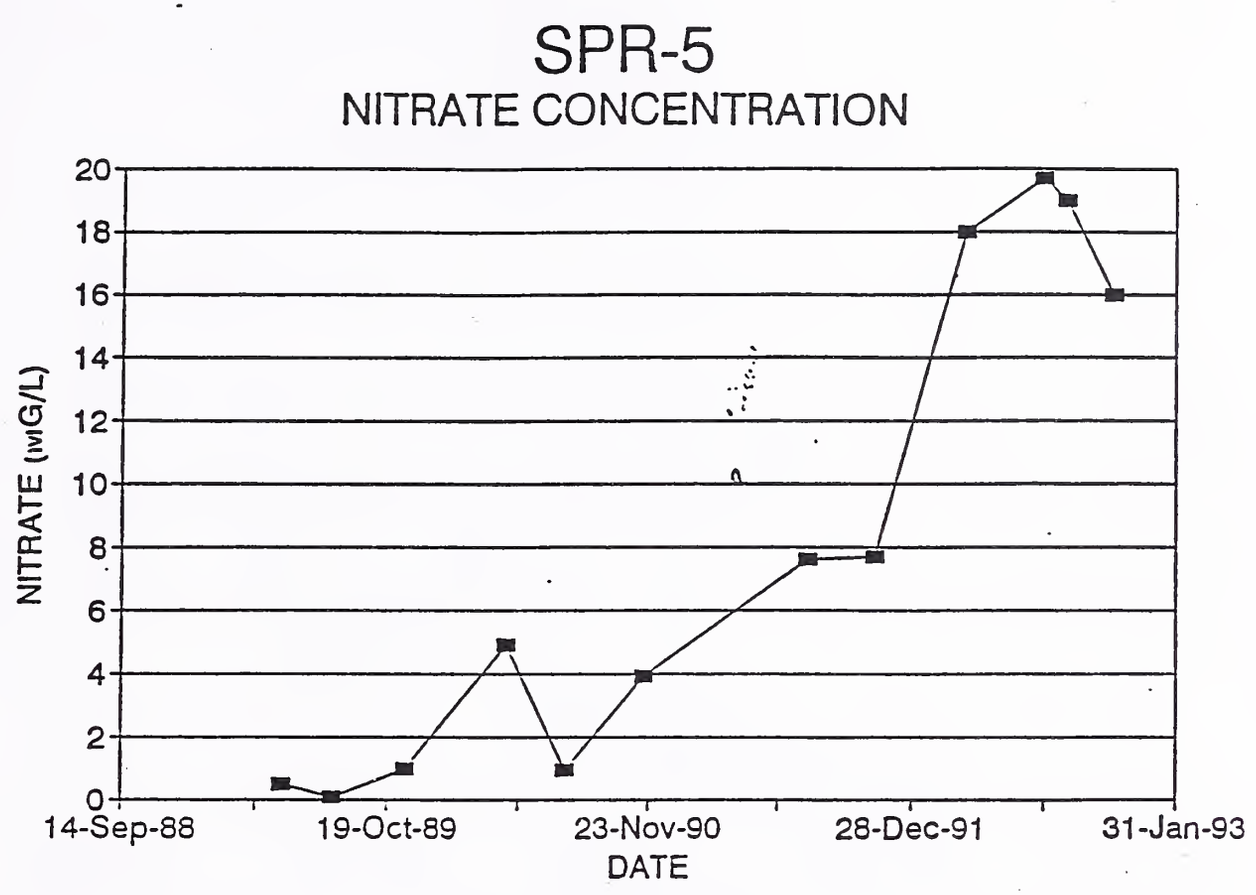
Station Number (1) SBB-	Perforated Interval (feet)	Aquifer	Mine Facility Monitored
SBMW-2**	112-152	Bedrock	South Beal (down gradient)
SBMW-3**	99-123	Bedrock	South Beal (down gradient)

(1) Well numbers preceded by SBB-87 are existing wells which have been monitored as part of the baseline water resources assessment. Well numbers preceded by SBB-88 are proposed operational monitoring wells. Perforated intervals indicated for these wells are estimates; actual screen depths will depend on site hydrology. All well locations are on Exhibit 1-4.

* New wells installed in November, 1991.

** New wells installed in July, 1992.

Figure 3.4


SPR-5
NITRATE CONCENTRATION
NITRATE (MG/L)
20
18
16
14
12
10
8
6
4
2
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

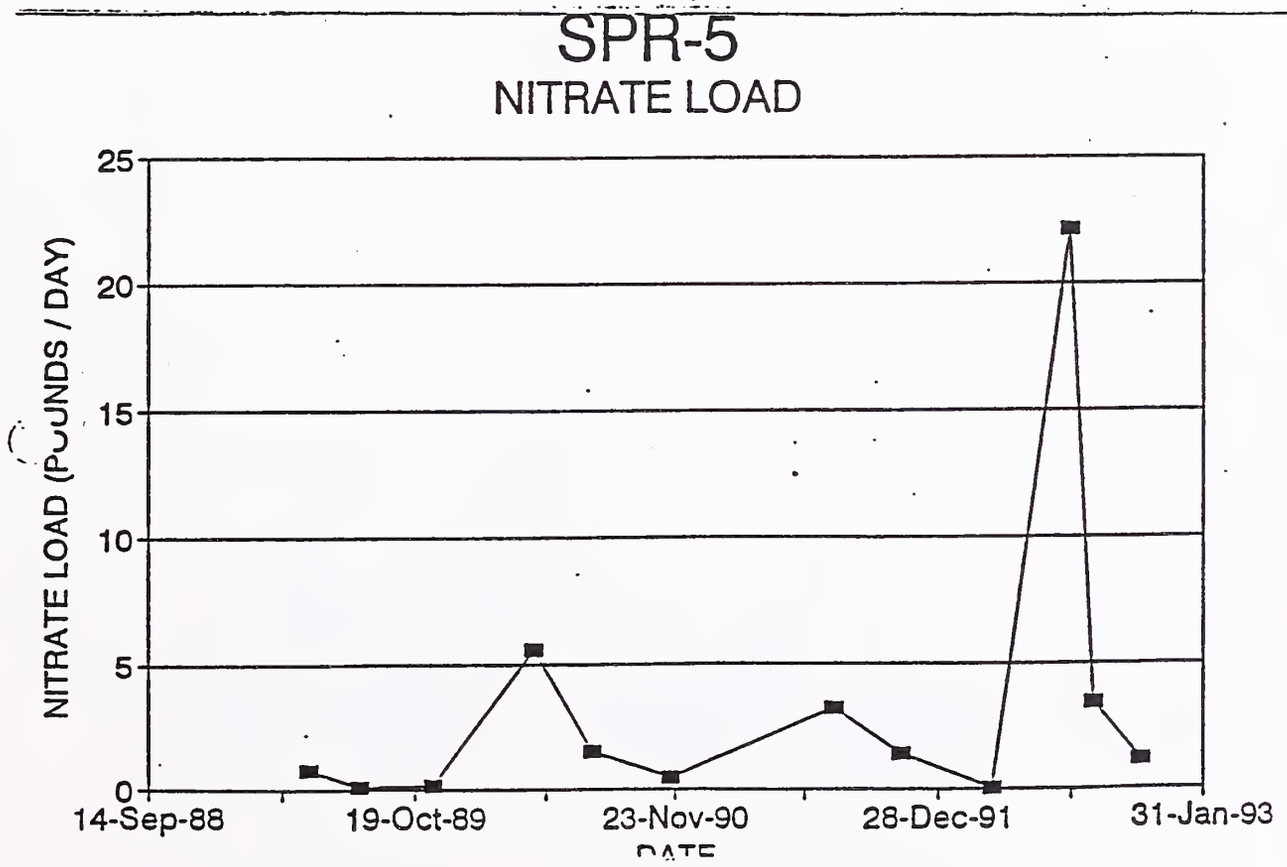

SPR-5
NITRATE LOAD
NITRATE LOAD (POUNDS / DAY)
25
20
15
10
5
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93

Figure 3.5

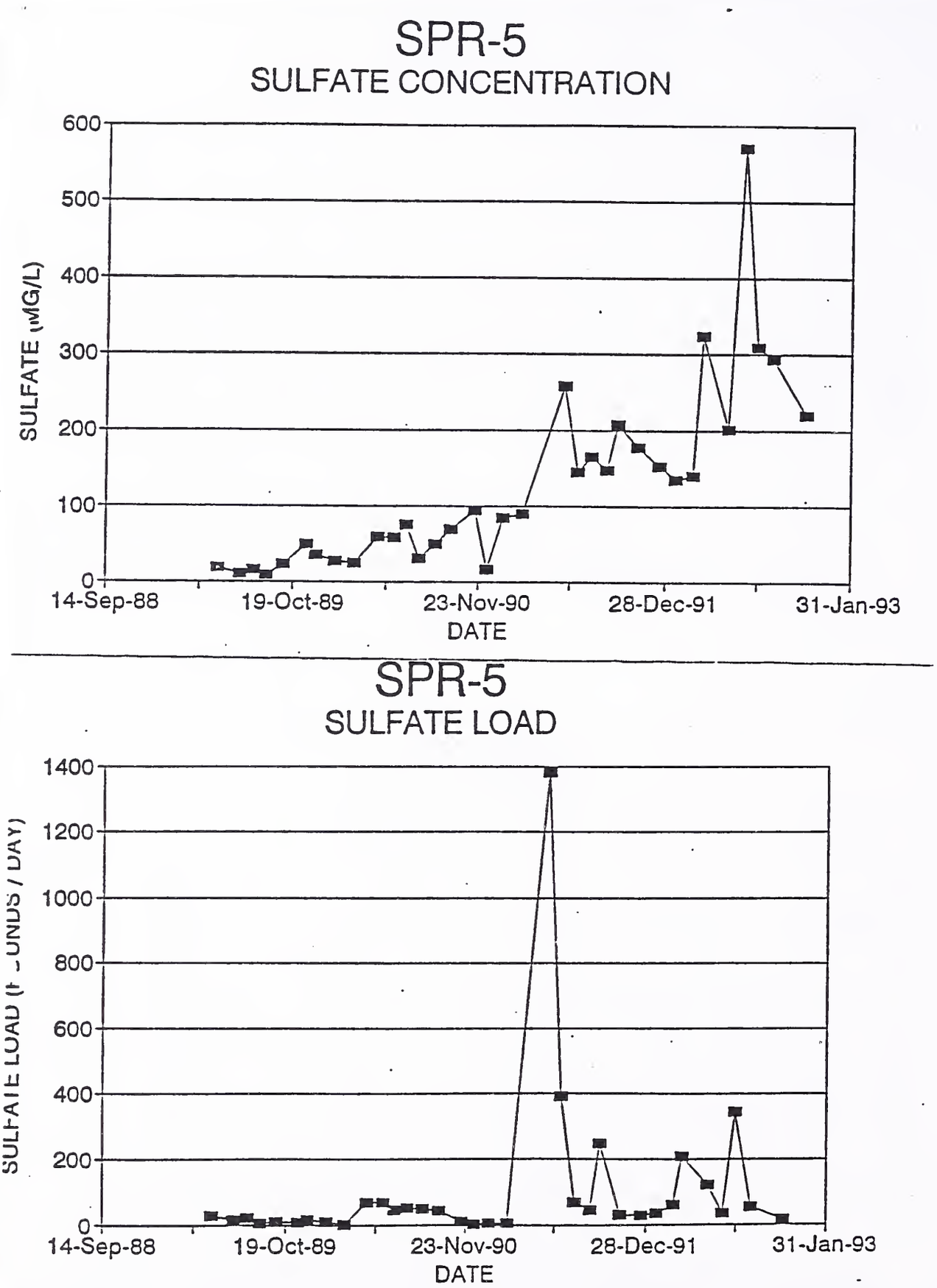
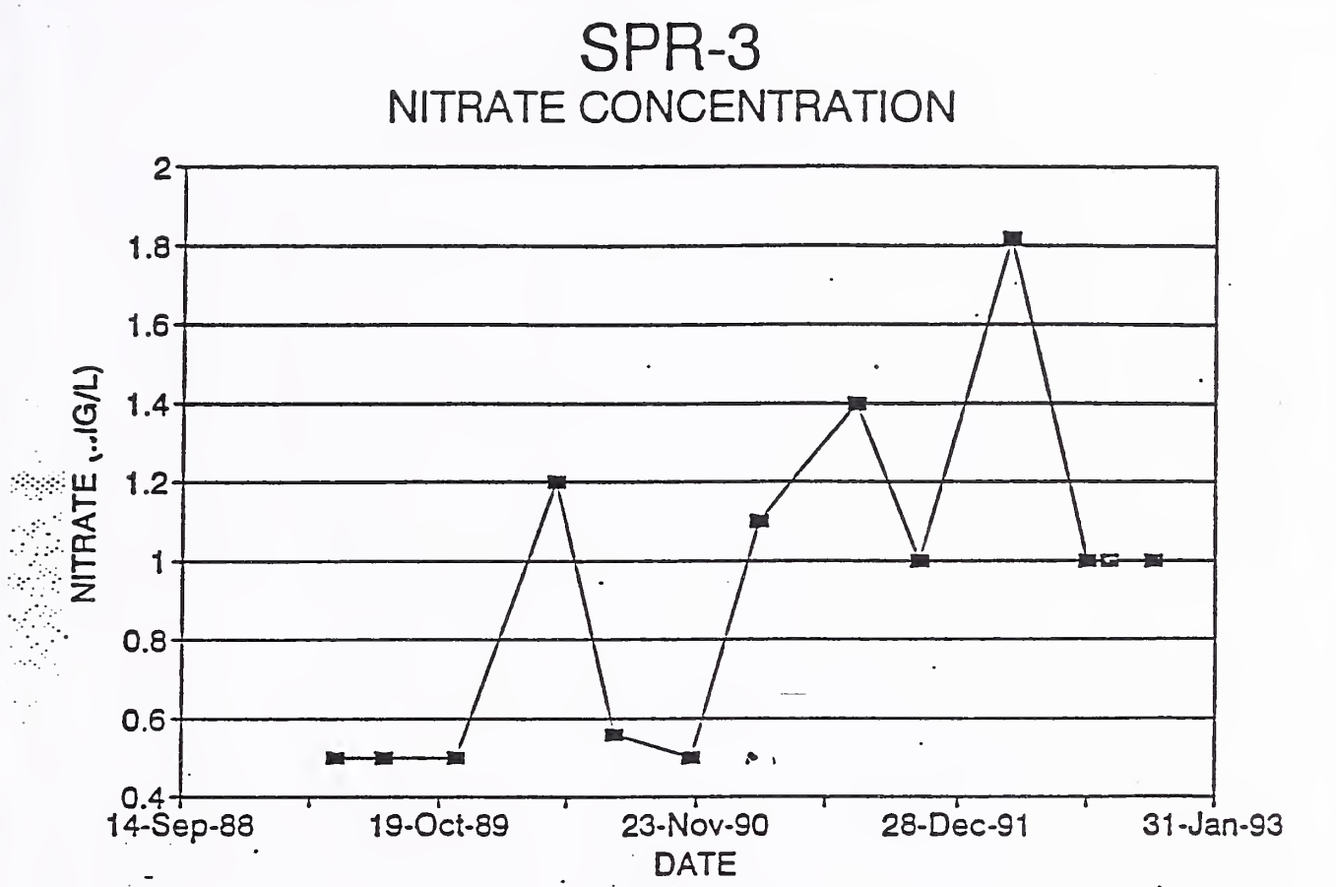

SPR-5
SULFATE CONCENTRATION
SULFATE (MG/L)
600
500
400
300
200
100
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE
SPR-5
SULFATE LOAD
1400
1200
1000
800
600
400
200
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure 3.6


SPR-3
NITRATE CONCENTRATION
NITRATE (MG/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

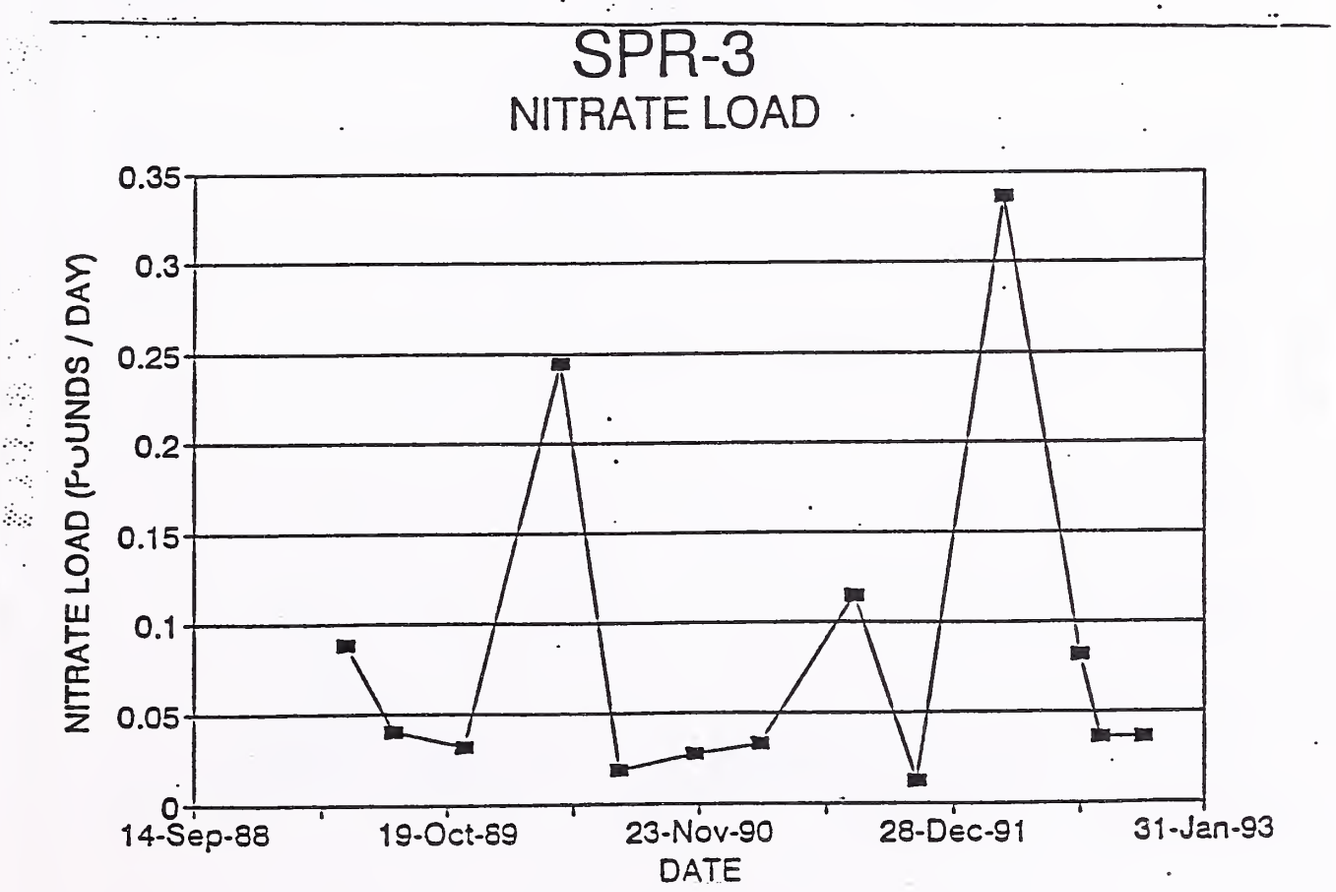
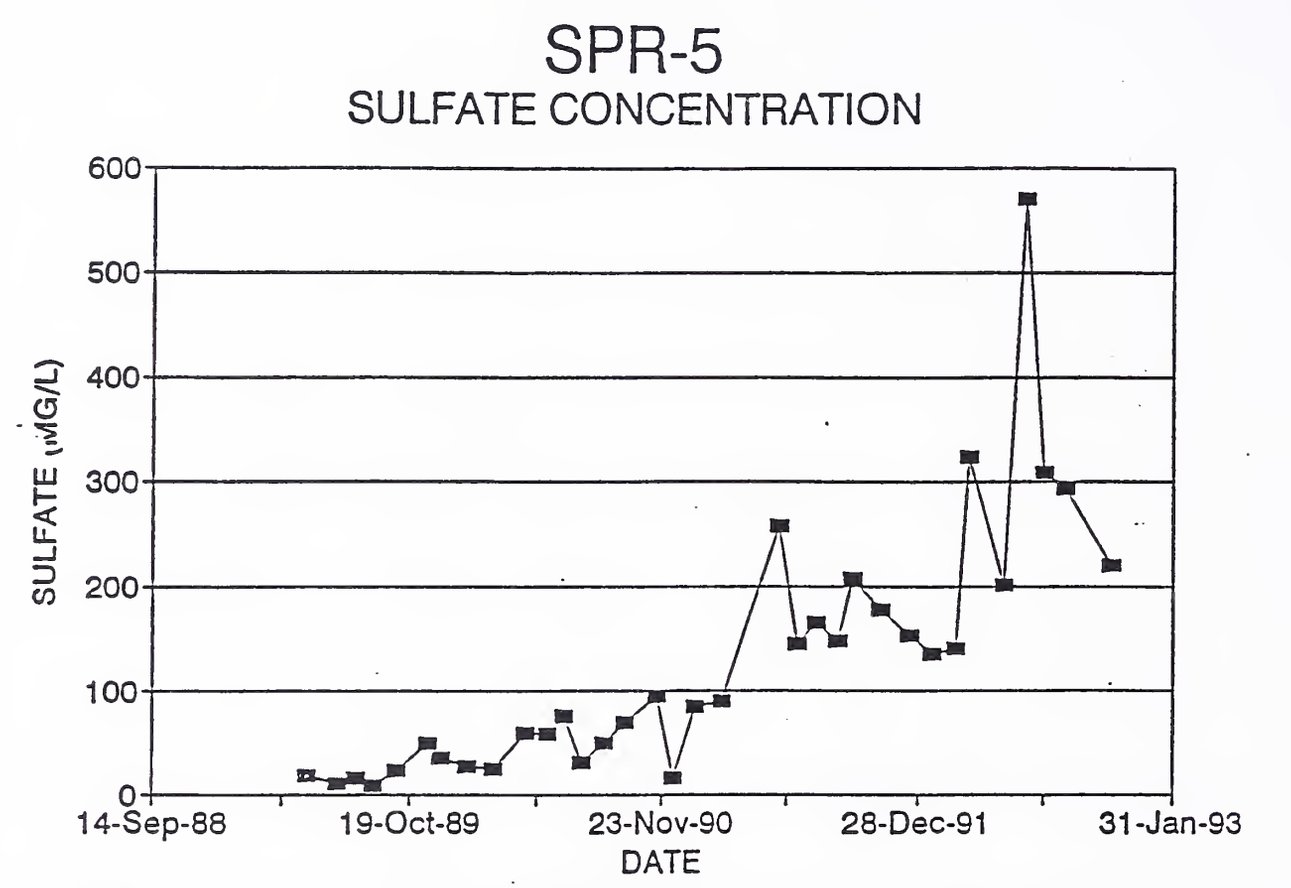

SPR-3
NITRATE LOAD
NITRATE LOAD (POUNDS / DAY)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure 3.7


SPR-5
SULFATE CONCENTRATION
600
500
400
300
200
100
0
SULFATE (MG/L)
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

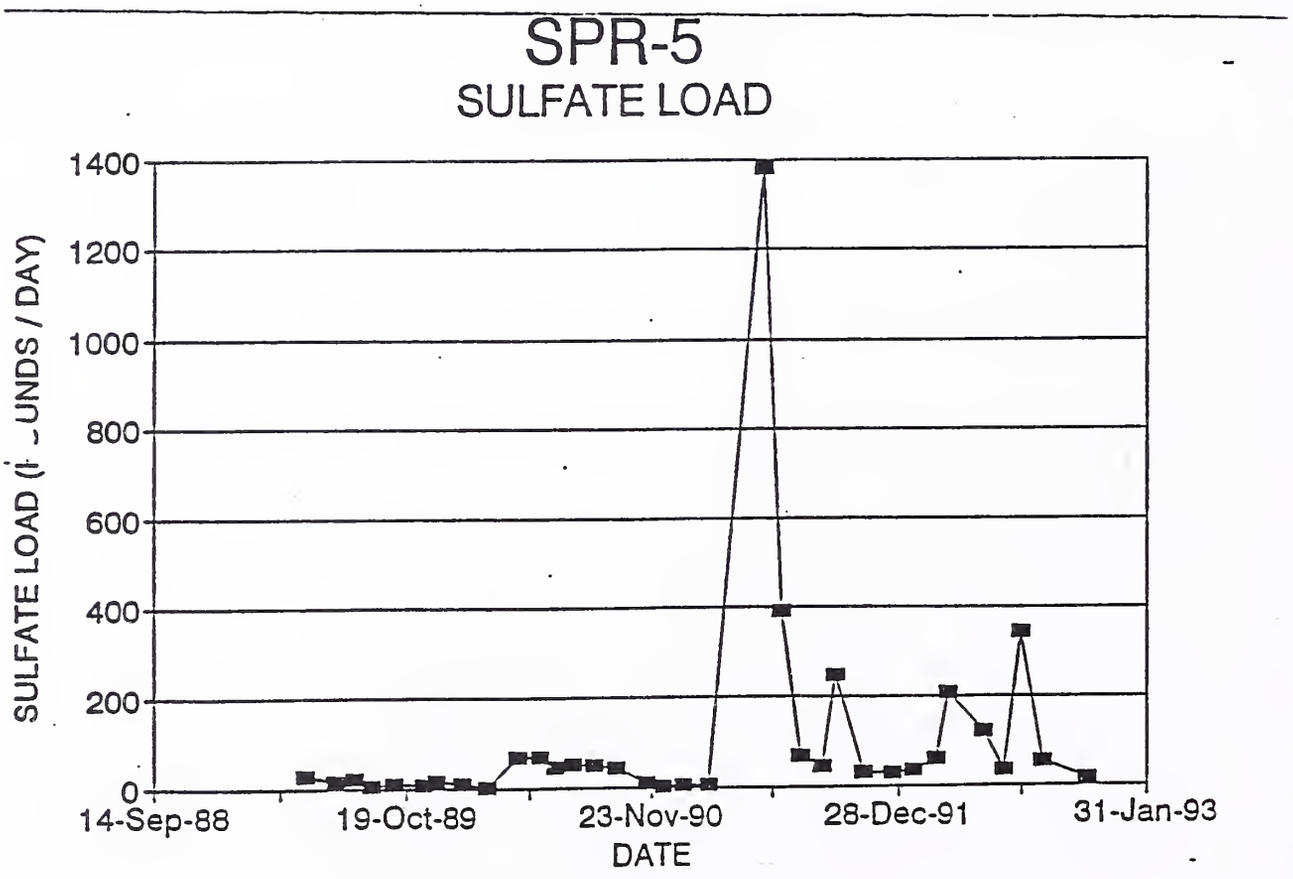
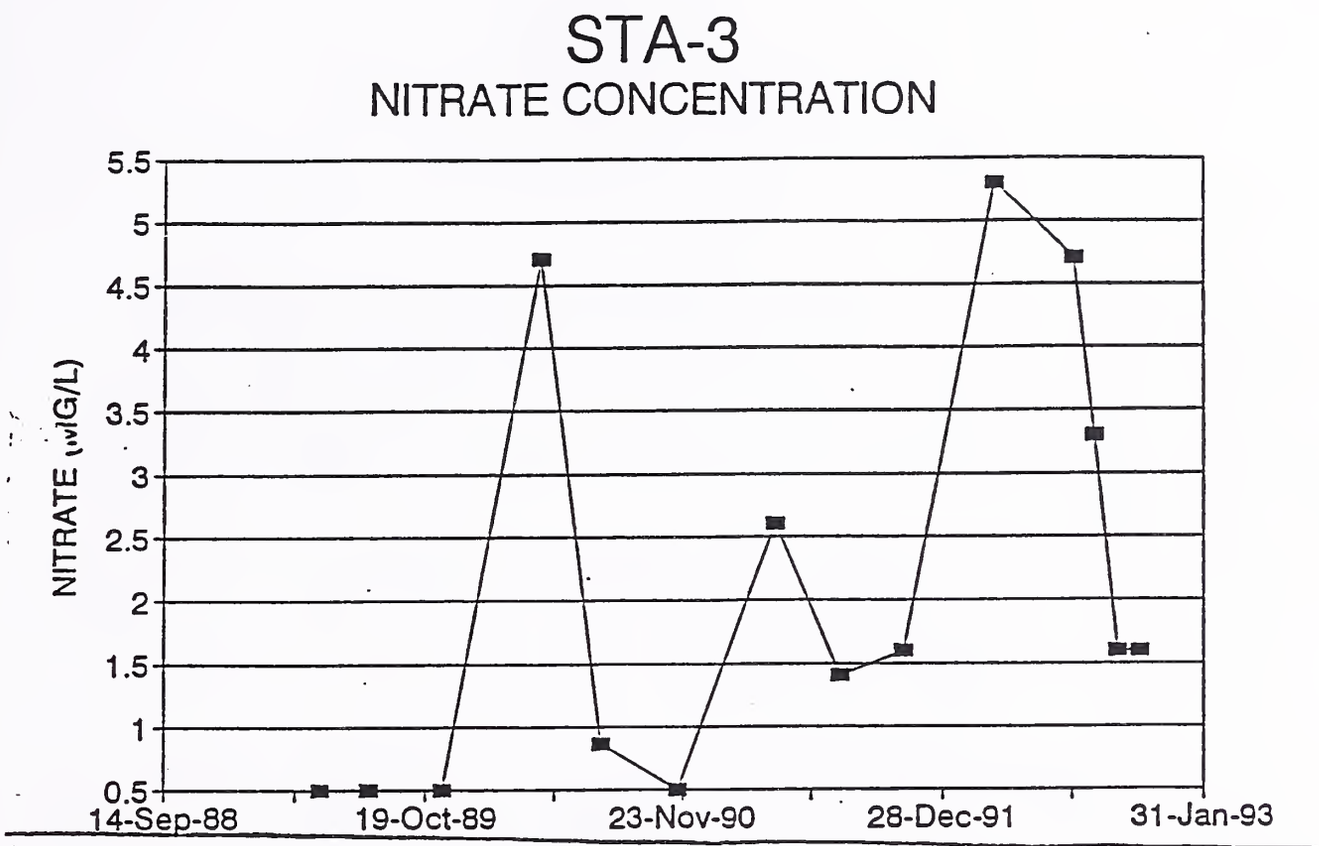

SPR-5
SULFATE LOAD
1400
1200
1000
800
600
400
200
0
SULFATE LOAD (POUNDS / DAY)
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure 3.8


STA-3
NITRATE CONCENTRATION
NITRATE (MG/L)
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93

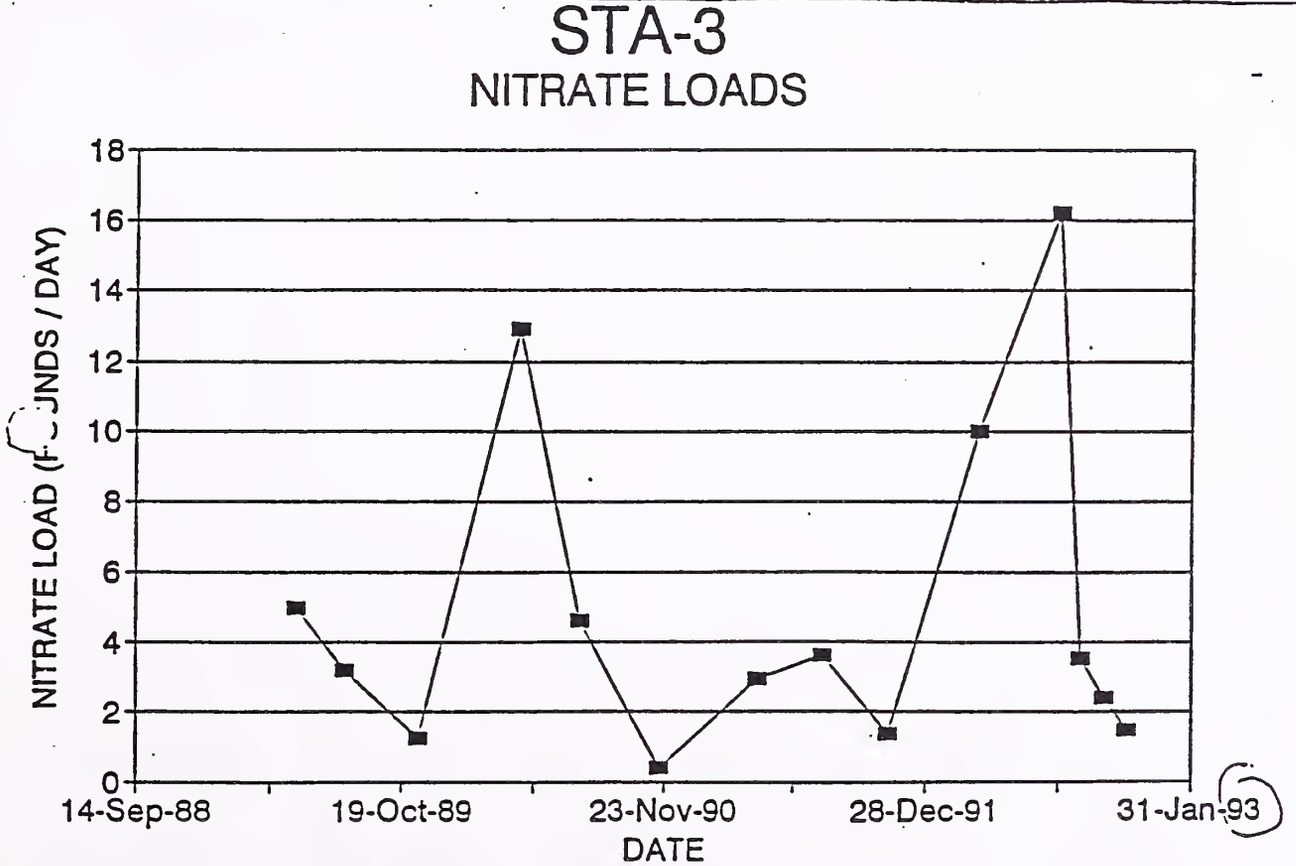
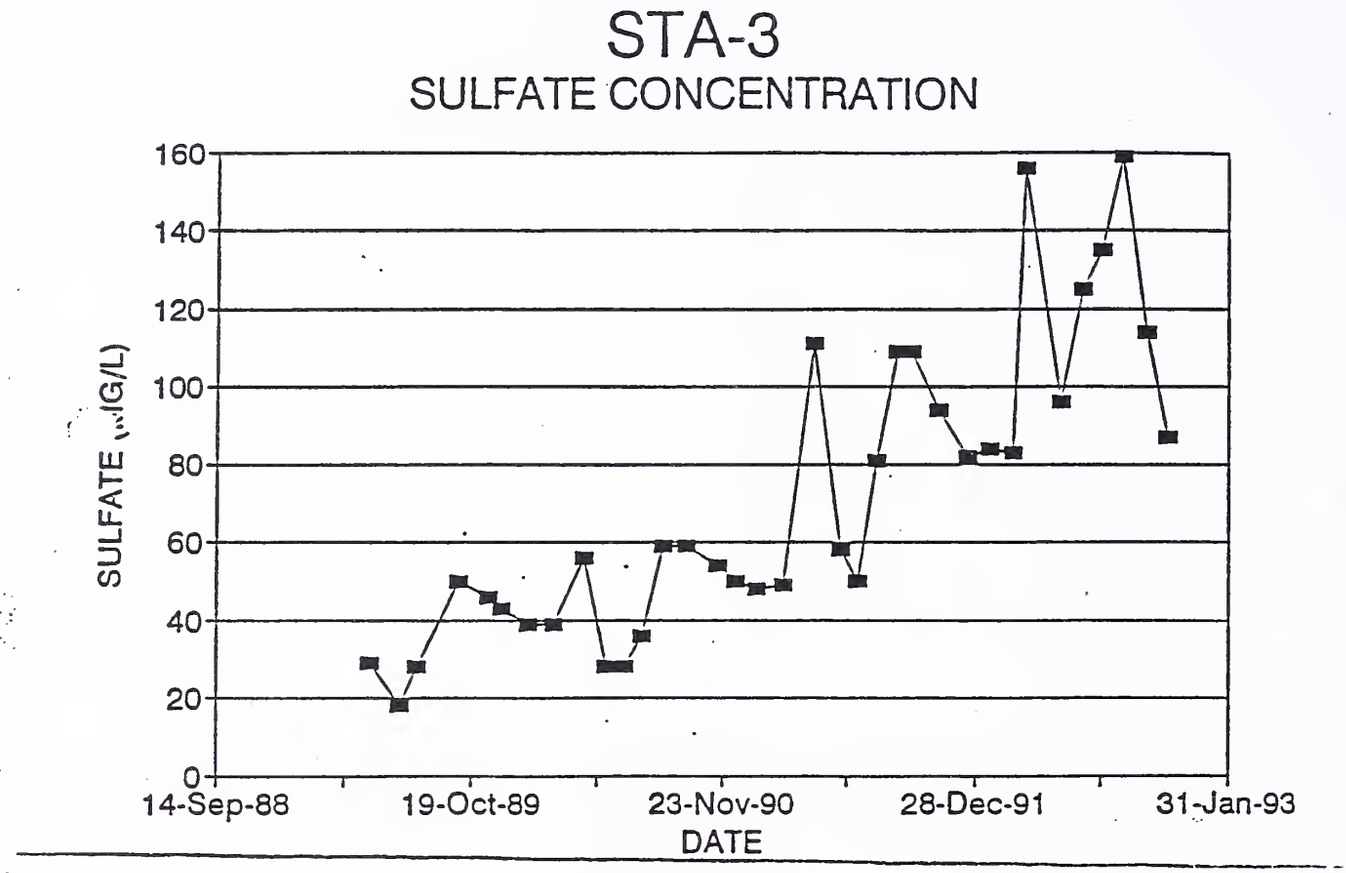

STA-3
NITRATE LOADS
NITRATE LOAD (POUNDS / DAY)
18
16
14
12
10
8
6
4
2
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure 3.9


STA-3
SULFATE CONCENTRATION
160
140
120
100
80
60
40
20
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

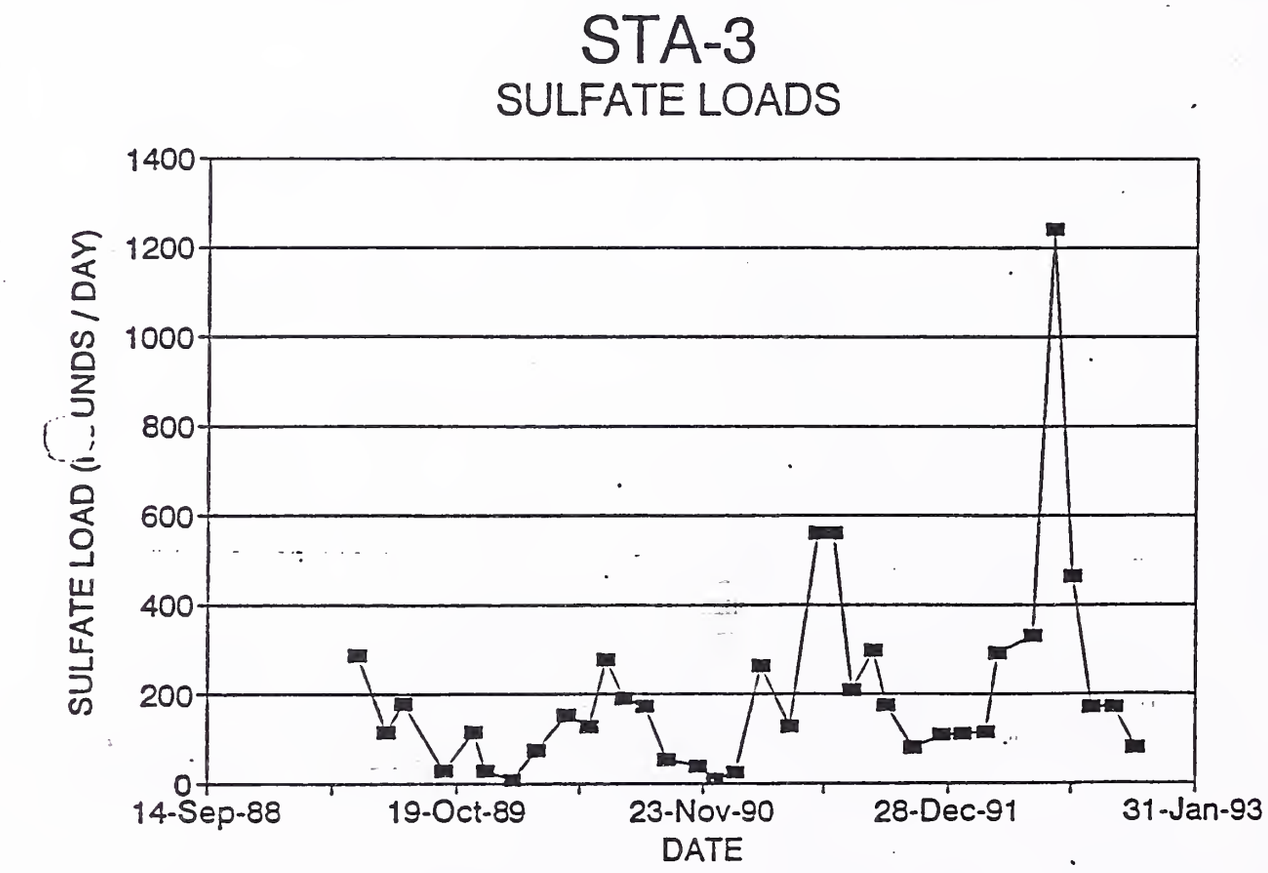
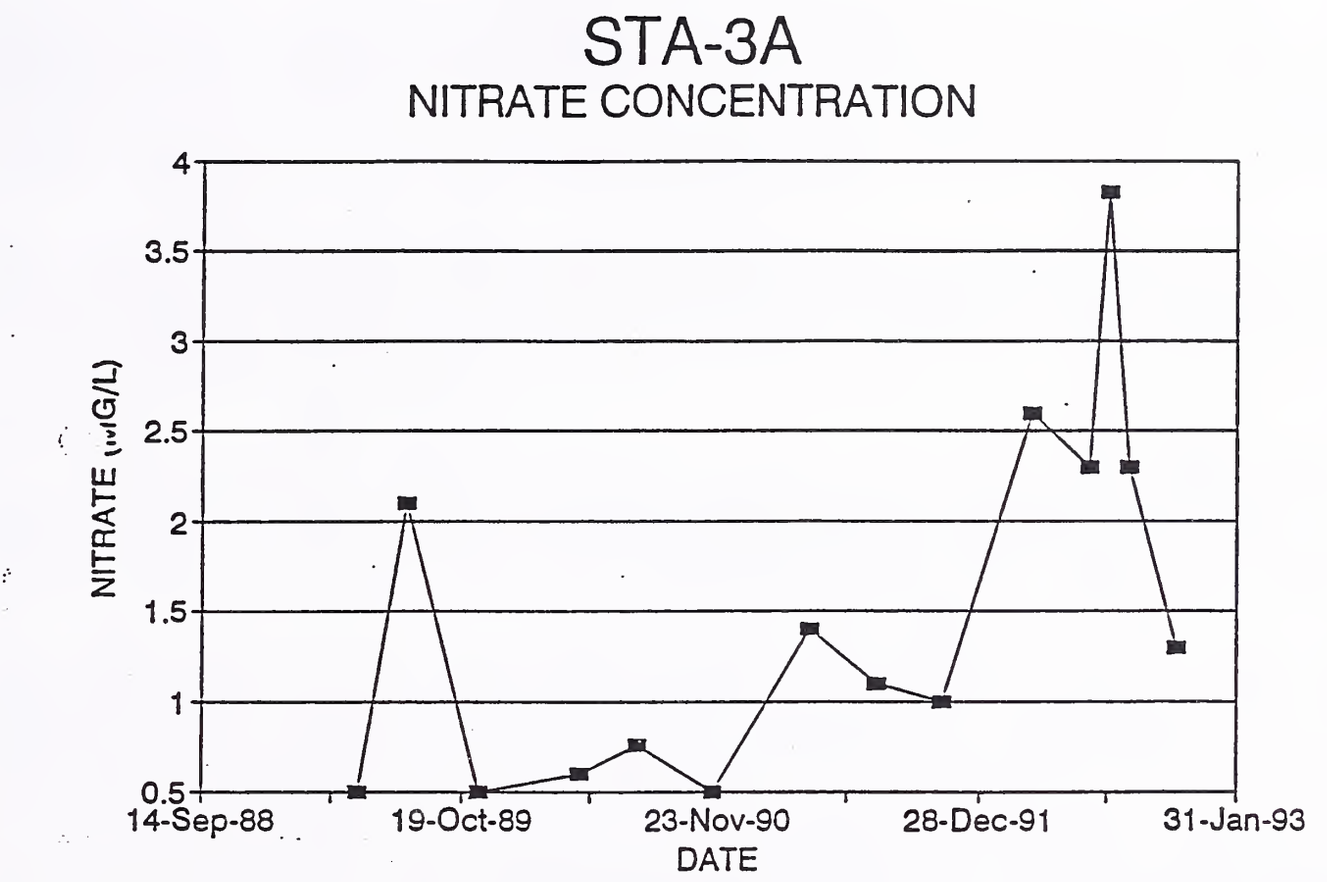

STA-3
SULFATE LOADS
1400
1200
1000
800
600
400
200
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure 3.10


STA-3A
NITRATE CONCENTRATION
NITRATE (MG/L)
4
3.5
3
2.5
2
1.5
1
0.5
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

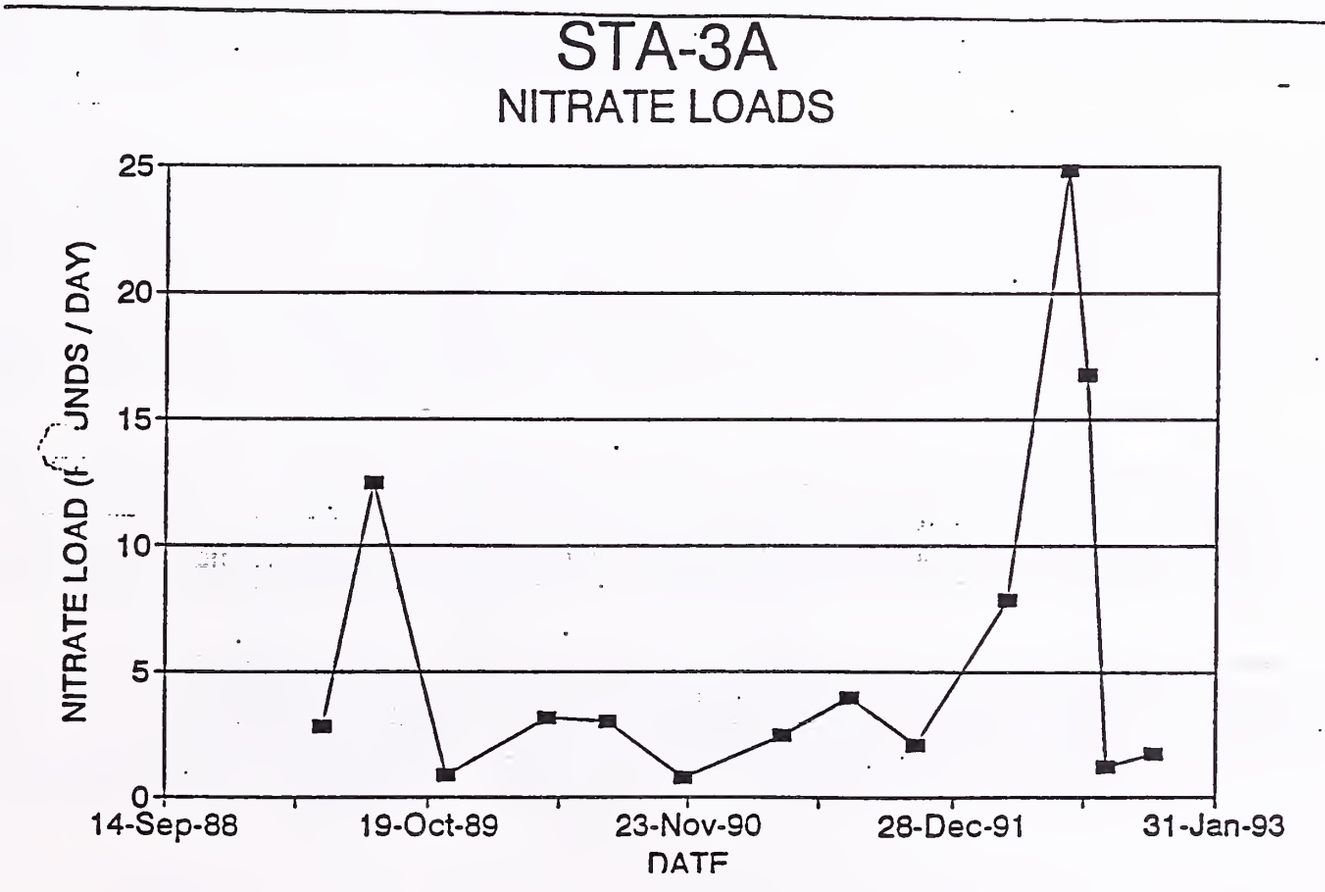
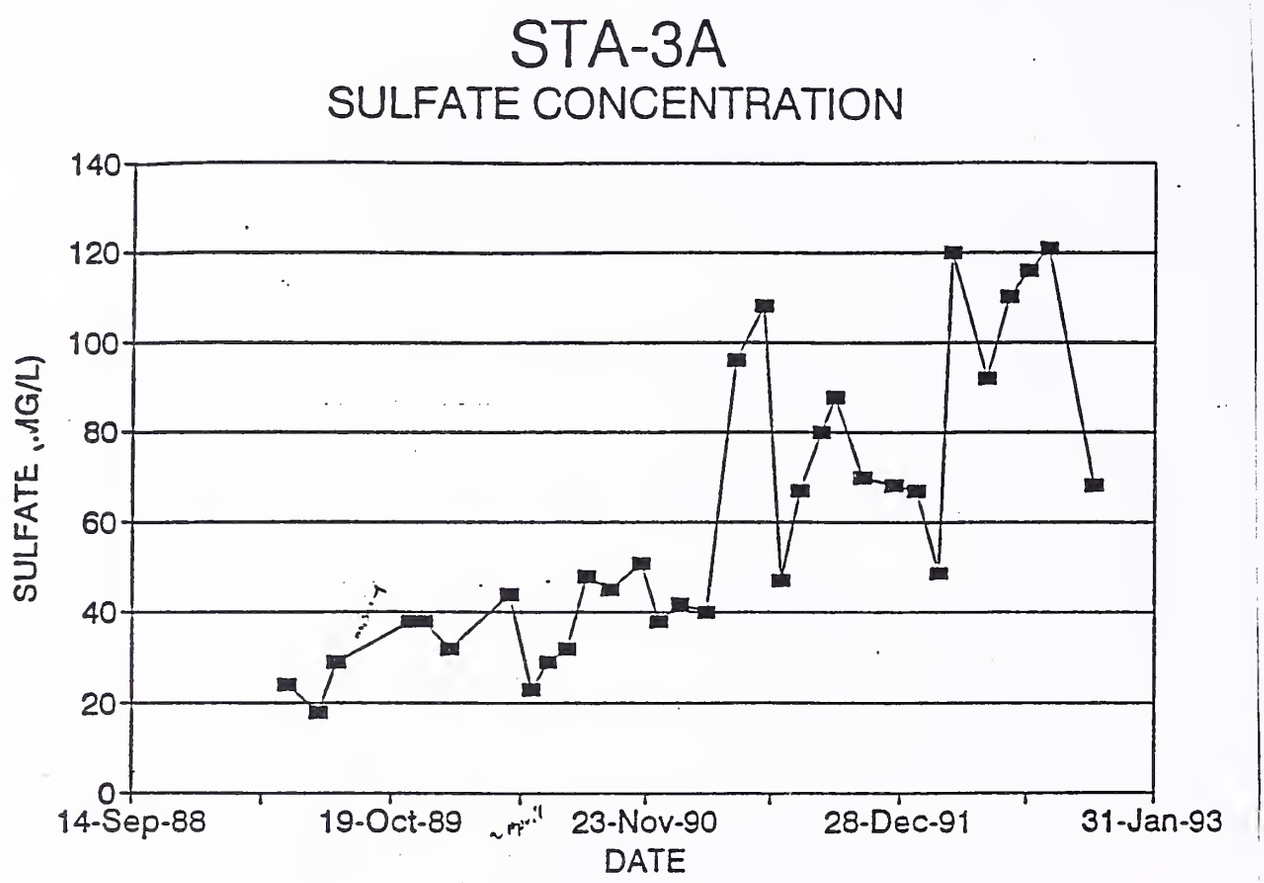
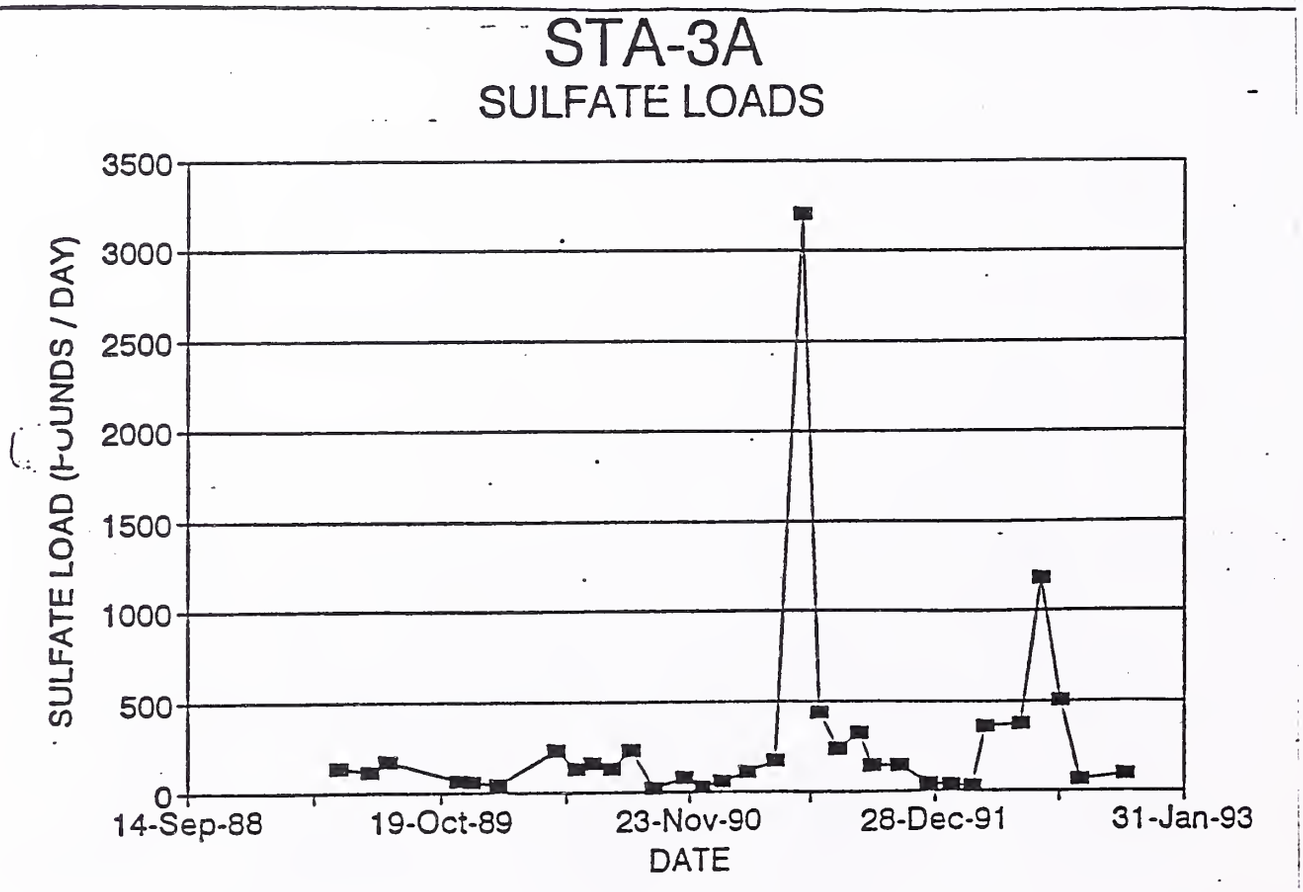

STA-3A
NITRATE LOADS
NITRATE LOAD (POUNDS / DAY)
25
20
15
10
5
0
14-Sep-88
19-Oct-89
23-Nov-90
28-Dec-91
31-Jan-93
DATE

Figure III.11





Samples from Spring 5, are representative of water emerging from the toe of the waste rock facility (Beal Mountain Mining, Inc. 1993). In 1992, water from Spring 5 showed a trend of increasing concentrations for TDS, hardness, sodium and sulfate. These increases in TDS and hardness may be the result of oxidation of iron disulfide minerals in the main Beal waste rock pile, dissolution of sulfate minerals, hydromulching, slash burning, or fertilizing (Schafer et al, 1992, 1992c). BMMI is diverting flow from Spring 5 to a catchment pond for use in the processing circuit whenever exceedances are noted.

BMMI is already using Best Management Practices for control of water quality related to the main pit. If necessary, mitigations designed to further protect water quality in German Gulch below the main Beal pit will be modified pursuant to Title 82-4-337 (Montana Code Annotated) of the Montana Metal Mine Reclamation Act to lessen impact to water quality.

Water Quality

Nitrate concentrations have increased in surface and ground water in the vicinity of the main Beal project relative to background baseline conditions. Nitrate concentrations have increased downgradient of the waste rock dump, downgradient from the leach pad on the north side, downgradient from the leach pad on the south side, and in German Gulch Creek. The Montana Water Quality standard for nitrate in ground water is 10 mg/L.

Nitrate levels in Spring 5 increased from below detection limit in 1987, 1988 and early 1989 to approximately 1 mg/L in the summer and fall of 1989. Nitrate concentrations remained around 1 mg/L throughout 1990 although an increase to 3.9 mg/L did occur in November. An anomalous concentration of 10.0 mg/l nitrate was reported in July 1989. This predates fertilization or placement of waste rock at the site, and may have been related to site clearing and slash burning. Alternatively, it may have been due to sampling or analytic error. Slash was later buried beneath the toe of the waste rock facility, near Spring 5, and may continue to contribute to the degradation of this spring. Nitrate concentrations peaked at 12.5 mg/L in April of 1991, but remained high at 7.6 mg/L in July of 1991 and 7.7 mg/L in November of 1991. In 1992, nitrate concentration in Spring 5 rose further, reaching nearly 20 mg/L before BMMI decided to capture the spring water. Possible sources of nitrate include ANFO (residual blasting compound residue on waste rock), fertilizer and slash and burn sites.

Down-gradient of the heap leach on the north side, nitrate concentrations have increased from below 1 mg/L in Spring 12A to an average of 14 mg/l in 1992. Well SBB 87-07 nitrate concentrations increased from below the detection limit to a peak of 3.7 mg/l in March of 1991. Nitrates in this area may be due to reclamation fertilization, drainage from an organically rich area immediately above the spring, fertilization of a newly constructed ditch, the heap leach, or the drain field adjacent to the plant area. Wells SBB 91-29 and SBB 91-30 were installed in 1991 to investiage sources of degradation of Springs 12 and 12A. These wells initially had nitrate concentrations of 27 mg/l and 14 mg/l, respectively, when first sampled in November of 1991. In 1992, these wells had average concentrations of 38 mg/l and 54 mg/l (nitrate + nitrite as N), respectively.

Below the leach pad on the south side, nitrate concentrations have increased in Spring 9 from below 1 mg/L to approximately 1.5 mg/L. Nitrate concentrations have increased in Well SBB 88-20 from 1 mg/L in 1988 to 3.2 mg/L in November, 1991. Nitrate concentrations increased in well SBB-87-13 from .6 mg/L in 1988 to 1.6 mg/L in 1992. Nitrate concentrations may be due to fertilization of the waste rock embankment. Spring 9, SBB 87-13 and SBB 88-20 also have elevated nitrate concentrations.

Nitrate concentrations have also increased in upper German Gulch. At surface water station 3 (below the pit and waste rock facility), the September 1987 baseline sample indicated a pre-mine nitrate concentration of 0.89 mg/l. Nitrate concentrations then dropped below the detection limit until 1990. Nitrate concentrations at surface water station 3, averaged 1.85 mg/L in 1990 and 1.7 mg/L in 1991 and at station 3A averaged 1.2 mg/L in 1991.

This increase is probably related to a decrease in flow rates for 1992. Water flowing from dewatering wells in the main Beal pit wall percolate through the floor of the pit and may carry nitrates to German Gulch; however, monitoring has not positively identified the pit area as a source. Analysis of algae samples from Stations 3 and 3A in German Gulch Creek tend to indicate unbalanced algal communities and a moderate degree of impairment to aquatic life (Loren Bahls, WQB memo, June 24, 1992).

Nitrate loading to German Gulch has been analyzed at Station 3A, which is downstream from all BMMI facilities. Nitrate concentrations at Station 3A were below the detection limit of 0.05 mg/L before mining began in 1988. Based on 1991 monthly flow data, nitrate loads at Station 3A were estimated to be 24.4 lbs/year in 1987, assuming that actual nitrate concentrations were one half of the detection limit. In comparison, the load of nitrate carried by German Gulch at Station 3A in 1991 was estimated to be 1,116.6 lbs/year, based on three water samples containing between 1.0 and 1.4 mg/L nitrate.

Summary of Water Quality Investigation History

On May 19, 1992, the DSL conducted an inspection at the Beal Mountain Mine to determine the source(s) of low concentrations of cyanide detected in the collection drain beneath the leach pad area and at other locations. As a result of this inspection, BMMI was issued a violation for failure to report a minor leak and associated repair work in May of 1991.

Based on water quality analyses of samples taken during the May 19th inspection and on observations made during a June 23rd, 1992, inspection, the DSL sent BMMI a certified letter on June 25th, 1992. This letter required BMMI to temporarily increase monitoring frequency at selected sites to verify that the cyanide solution loss problem had been completely remediated. In the same letter, DSL required BMMI to increase the frequency of sampling for nitrate and to investigate the causes of water quality degradation at monitoring site SPR-5.

On July 1st, 1992, BMMI met with the agencies to discuss the preliminary findings of their nitrite and sulfate source investigations. A draft report on nitrate sources was received by DSL on July 17, 1992, and a draft sulfate study was received on September 1st, 1992.

A meeting was held on November 5, 1992 to discuss DSL's and the DLNF'S findings regarding the adequacy of these draft studies. BMMI agreed to do a more through analysis of nitrate and sulfate sources during the 1993 operating season. The results of these investigations will not be available until the autumn of 1993. Other studies, including land application and geochemical characterization, were also discussed.

DSL issued a violation to BMMI in March of 1993 for failure to follow the approved reclamation plan which requires use of phosphorus fertilizer rather than nitrogen based fertilizer during seeding. Excessive use of nitrogen based fertilizer appears to be a major contributing factor to nitrate degradation at the Beal Mountain mine.

In June of 1993, the agencies determined that is was necessary for BMMI to apply for a MPDES permit. BMMI is proceeding with the application process.

Aquatic Biology

Biological resources of German Gulch were inventoried in 1984 as part of the pre-mine baseline study and to support instream flow recommendations (MDFWP, 1984). Both periphyton (attached algal communities) and aquatic macroinvertebrates were inventoried in this analysis. Ongoing (operational) biological monitoring was not required, therefore, it is difficult to assess if changes in water quality have affected the biological communities in German Gulch. However, two periphyton samples were collected by the WQB in 1992 during routine field inspections and provide a basis for partial assessment on current conditions.

Biological sampling in 1984 was limited to German Gulch below the confluence with Edward Creek to the mouth of German Gulch Creek. The 1992 samples were collected at Stations 4, 3A, 2A and Beefstraight Creek (see Figure 3). Table 3.1 shows the results of baseline and recent algal standing crop measurements measured in milligrams of chlorophyll-a per meter squared (mg chl-a/m^2). Relative to the 1984 samples, chlorophyll concentrations in recent samples appear to have increased. This increase is likely a result of the increased nitrogen concentration in German Gulch resulting from mine related activities. Standing crop measurements at the upper site should be lower than the downstream site since headwater streams are generally less productive and growth is limited by temperature (growing season), light, gradient and other factors.

Table 3.1 Mean Chlorophyll Concentration (mg chlorophyll-a per square meter) in Periphyton Samples Taken from German Gulch in 1984 and 1992

Location/Date	7-18-84	7-9-92	9-1-92
Station 4 (upper GG)	-	-	68
Station 3A (below Mine)	-	80	61
Station 2 (below Edward Gulch)	32	11	-
Station 1 (below Beefstraight)	12	-	-
Station GG mouth	4	-	-

GG=German Gulch

Algal growth becomes visible at concentration greater than 50 mg chl-a/m^2 and may impair other uses at concentrations greater than 100 mg chl-a/m^2 (Welsh, et al., 1988 and Nordin, 1985). Currently, no numeric criteria exist addressing algal growth, however, Montana Water Quality Standards prohibit the growth of undesirable aquatic life (ARM 16.20.633(1)(e)).

Diatom diversity declined from 4.22 in 1984 to 3.63 in 1992 at Site 2A on German Gulch (below Edward Gulch). Diversity values tend to be lower in unproductive headwater streams and tend to increase with moderate increases in nutrient concentrations. Under excessive nutrient inputs, numeric dominance by a few undesirable taxa tends to decrease species diversity. Diatom diversity in ecologically similar streams ranged from 2.48 to 4.50 with a mean of 3.61 (Bahls, et al, 1992).

Periphyton community composition in German Gulch at the upper sites (4 and 3A) was dominated by a species of green algae (*Ulothrix* spp.) in 1992 (Bahls, 1992a and 1992b). This species was rare in earlier sampling and represents a change in community structure likely resulting from the increased nitrogen concentration. Community composition was relatively unchanged at Site 2A.

Periphyton samples collected from the upper reaches of German Gulch showed a moderate degree of impairment from sediment, as well as nutrients (Bahls, 1992a and 1992b). Aquatic macroinvertebrates and fish are also sensitive to sediment increases, however, biological monitoring has not been conducted to assess any change in these communities.

WILDLIFE

Biodiversity

This section examines the current status of biological diversity in the Beal Mountain Mine area. The agencies have taken a hierarchical approach in describing the existing environment. The broadest scale encompasses the Fleecer Mountain complex while the smallest scale is the hillside where the pits would be mined. We examined overall landscape patterns as well as habitats and wildlife species that may be affected by this project.

The Fleecer Mountain Complex

The Fleecer Mountain complex is a relatively isolated mountain range surrounded by lower elevation non-forested lands to the north, east, and south. To the west this complex is connected to the Pintler Range which is part of the Anaconda Pinter Wilderness. Elevations range from about 5,400 feet to 9,400 feet. The vegetation pattern and composition is typical of Eastside Rocky Mountain landscapes. Abrupt changes from grassland to forest habitat type characterize this mosaic. The lower elevations support grasslands and shrublands which merge into Douglas-fir type forests. Higher elevations support subalpine fir type forests which are dominated by lodgepole pine. The complex is managed by the DNF, Beaverhead National Forest, Mount Haggin State Game Range, and private owners.

The Fleecer Mountain complex supports approximately 1,500 elk and is one of the most heavily hunted areas in Montana (MDFWP, 1992). Human-caused disturbances already impact the entire complex. Turn of the century gold mining camps and works are evident in most drainages. Roads and trails access most of the area. Many of the drainages on the north end of the range have been placer mined. Timber harvest is evident throughout the range, and is ongoing on the Mount Haggin Game Range and in the Beaverhead National Forest portion of the range.

German Gulch Landscape Patterns

According to the 1988 Beal EA, the Beal's Hill area contained "significant wildlife resources both in terms of wildlife populations and valuable habitat features. Most of the species common to the DNF can be found in the Beal's Hill area." Since 1988, the mine has impacted approximately 425 acres of forest/grassland habitat along with the associated riparian areas. Due to existing disturbance, discussed in Chapter I, the existing main Beal mine site is not available for wildlife habitation. Big game and some bird species are found in the forests and grasslands adjacent to the mine.

The portion of the Fleecer Mountain Complex that encompasses the German Gulch drainage is essentially an island of forested habitat with less vegetative disturbance evident than elsewhere in the range. The block includes approximately 10 square miles of land that runs from German Gulch to Burnt Mountain, and Minnesota Gulch to Norton Creek. Large open parks within Douglas-fir and lodgepole pine forests characterize the German Gulch drainage. Most south facing slopes are grassy parklands while the area becomes more forested as aspect changes to the north. The German Gulch drainage was heavily impacted by turn of the century gold mining. Many of the riparian areas were placer mined and hundreds of people lived in the area.

The current level of human disturbance in the area of the proposed South Beal pits has already affected the capacity of the hillside to support wildlife. Currently, the site is crisscrossed with exploration roads and numerous test hole locations. Heavy equipment is routinely found working over the area.

Regional Linkages

Approximately 2 miles to the west and the north of Beal's Hill, open parkland begins to dominate the landscape. To the east and south, forest habitats interspersed with open meadows continue for 6 to 10 miles respectively. The Mill Creek Pass, 6 miles to the east of the project area, is the linkage between the Anaconda-Pintler Range and the Fleecer Range. This area is characterized by forested stringers in open grassland and shrubland habitats, and is bisected by State Highway 274 between Anaconda and Wise River. Elk use this linkage yearly, migrating from winter range along the east front of the Fleecer Range to summer range in the Mount Haggin area of the Anaconda-Pintler Range.

The Beal's Hill area is part of a migration corridor for elk, waterfowl, raptors, and migratory songbirds. German Gulch is one of the main conduits into the Fleecer Range from the north (Beal Mountain Mining Inc., 1988).

Edges

The unique microclimate along a major structural edge affects floral and faunal composition such that species diversity and density are often greater than in the communities on either side (MacArthur and MacArthur, 1961). The edge influence may extend several hundred feet into the forest community. Induced edges, such as those created by wildfire or roads, may select for edge-adapted species to the detriment of interior forest residents. Increased competition, predation, and nest parasitism are the factors that contribute to the decline of interior species when edge species are introduced.

Eastside Rocky Mountain forests are naturally fragmented and diverse at the between-habitat level. This is a function of dissected topography and broad elevational gradients. The agencies assume that most wildlife species present are native to this ecosystem, and are adapted to this relatively high complexity of habitat types.

The Beal's Hill area is characteristic of an eastside Rocky Mountain landscape. Abrupt edges occur between forests and natural parks. However, most edges in this landscape are less abrupt than grassland to forest. Forest types blend together or different aged stands grow side by side. Most of these textural changes on the landscape are a function of topography, aspect, moisture, and soils. Fire historically played a role in shifting edges and these patterns are still evident today.

Riparian Areas and Associated Species Including MIS

Riparian areas include streams, ponds, swamps, wet meadows, sidehill seeps, and the habitats immediately adjacent to them (usually within 100 feet). Riparian areas are typically the most biologically diverse and productive of Rocky Mountain environments. They serve as reliable feeding areas for many species of wildlife and provide habitat that is diverse in structure and composition.

As discussed in the main Beal application (Beal Mountain Mining Inc., 1988), the Beal's Hill area has many wet meadows and sidehill seeps. The area that would be disturbed by the South Beal pits does not contain any seeps. During the course of the mine construction and subsequent exploration many of these sites have been impacted. Some seeps and wet meadows have been destroyed but most have had mitigation measures taken to protect them as much as possible. This does not however insure that they are functioning as undisturbed riparian areas would. The headwaters of the German Gulch Drainage, where the mine is situated, have been adversely impacted by road construction and mining since before the turn of the century (see surface and ground water discussions). Approximately 4 acres of stream habitat has been destroyed during mine operation. All of the stream habitat is in private ownership. Areas of the sidehill where the South Beal Project is located, other than the location of the proposed pits, have some moist forest sites and sidehill seeps, mostly at contact points in the bedrock.

Beaver are present below the permit boundary where Beefstraight Gulch and German Gulch meet. No beaver sign is evident within the permit boundary. There are other species associated with riparian areas in this region. No surveys were performed for these species. However, this analysis assumes that historically the riparian sites within the permit boundary provided suitable habitat for them.

The DNF selected Management Indicator Species (MIS) for riparian areas are listed in the Forest Plan (1987). The presence, absence, and abundance of these species in a particular riparian site should indicate the quality of that area. This approach requires that these species be inventoried and monitored. It also assumes that these species accurately reflect riparian conditions and that baseline monitoring occurred. For the DNF these species are:

Shrub Riparian - Belted Kingfisher, Willow Flycatcher
Tree Riparian - Northern Water Shrew, Warbling Vireo
Wet Meadow - Western Jumping Mouse
Marshland - Blue-winged Teal

Belted Kingfisher (*Ceryle alcyon*)

Belted Kingfishers occur within the vicinity of the Beal's Hill area. They are relatively common along shrubby banks of the Clark Fork River (personal observation), 7 miles northeast. Habitat for this species is common throughout the German Gulch and Beefstraight drainages. Within the boundaries of the permit area, the only available habitat is along German Gulch Creek where fish populations provide a food base. There is no beaver activity above the permit boundary so stream depths are shallow and this may discourage Belted Kingfishers from foraging (generally diving headlong into the water from a hover in the air). Because of the current mine activity, 4 acres of shrubby riparian habitat is no longer available to Belted Kingfishers within the permit boundary. Belted Kingfishers were not surveyed for and none were detected during casual observation

Willow Flycatcher (*Empidonax traillii*)

The Willow Flycatcher is found in low to mid-elevation deciduous riparian thickets and wet meadows. They can also inhabit open brushy slopes, dry shrubby uplands, and forest openings below 7,000 feet (USFS, 1990). Below the permit boundary much of German Gulch is appropriate habitat for Willow Flycatchers. Above the boundary, 13 acres of habitat was available however, 4 acres (31 percent) have been removed because of mining activity. Suitable upland habitats such as shrubby slopes are not common and the permit area lies at the 7,000 foot level, probably limiting Willow Flycatcher abundance. Willow Flycatchers were not surveyed for and none were detected during casual observation.

Northern Water Shrew (*Sorex palustris*)

The Northern Water Shrew inhabits small cold streams with cover on the banks (Burt and Grossenheider, 1976). German Gulch Creek provides the only habitat within the permit boundary. Past and present mining impacts have probably limited the Northern Water Shrew habitat along this creek. Four acres are totally unavailable and the remaining 9 acres do not have the heavy cover along the streambanks that makes desirable habitat. Northern Water Shrews were not surveyed for and none were detected during casual observation.

Warbling Vireo (*Vireo gilvus*)

The Warbling Vireo requires open deciduous and mixed deciduous-coniferous forests, especially stream-side vegetation, but also groves and scrubby hillside trees. It prefers forests with a substantial forb or shrub layer and low to intermediate canopy cover (DeGraaf et. al., 1991). Suitable habitat occurs for Warbling Vireos in Beefstraight Gulch, American Gulch, and parts of German Gulch. Some stretches of German Gulch Creek within the permit boundary have suitable shrubby forested cover. Mining has made 31 percent of the habitat within the boundary unavailable. Warbling Vireos were not surveyed for and none were detected during casual observation.

Western Jumping Mouse (*Zapus princeps*)

The Western Jumping Mouse inhabits areas near streams with lush grass and forb growth (Burt and Grossenheider, 1976). German Gulch Creek within the permit boundary does not have this sort of thick grass/forb characteristic. The stream channel is composed of exposed rock with a steeper gradient than areas that generally have heavy grass/forb cover. Mining activity has also modified the stream channel, turning over the cobble bottom and leaving it along the edges of the riparian zone. Some hillside wet meadows that existed where the leach pad is today may have supported Western Jumping Mice. The slope where the South Beal Project is proposed does not have any suitable habitat. Western Jumping Mice were not surveyed for and none were detected during casual observation.

Blue-winged Teal (*Anas discors*)

Blue-winged Teal prefer fresh water marshes, rivers, and ponds with moderate cover. They also prefer calm water or sluggish currents rather than fast water (USFS, 1990). Below the permit boundary there is suitable habitat for Blue-winged Teal in the beaver ponds along Beefstraight Gulch. There is no suitable habitat within the permit boundary. This area is within a migration corridor for waterfowl that often stop over at the Warm Springs Ponds about 12 miles to the north. It is possible that Blue-winged Teal could be attracted to any holding ponds created by the mine. Blue-winged Teal were not surveyed for and none were detected during casual observation.

Lodgepole Pine/Douglas-fir and Associated Species Including MIS

The forested habitats that the current mine and exploration have impacted are primarily lodgepole pine (subalpine fir series) and Douglas-fir. The hillside where the proposed expansion is located is occupied by lodgepole pine with pockets of subalpine fir.

Within timber compartments 406 and 407 where the permitted area is located, there are 12,251 forested acres and 2,996 grassland acres. Seventy-nine percent of the forested acres are mature stands (trees greater than 9 inches diameter at breast height (Table 3.2). The forest species composition is dominated by lodgepole pine with 7,244 acres of Lodgepole pine habitats, 1,183 acres of Douglas-fir, and 1,393 acres of spruce/ subalpine fir. The DNF has listed the Hairy Woodpecker as the Management Indicator Species for Lodgepole pine forests.

Table 3.2 Forested and Nonforested Habitat Acres Within Timber Compartments 406 and 407

Compartment	406	407	Combined
Forest			
Seedling/sapling	0	0	0
Pole Timber	611	1948	2559
Mature Timber	4685	5007	9692
Subtotal	5296	6955	12251
Nonforest			
Dry Meadow	534	2335	2869
Wet Meadow	56	71	127
Subtotal	590	2406	2996

Hairy Woodpecker (*Picoides villosus*)

The hairy woodpecker can occur in lodgepole pine, ponderosa pine, subalpine fir, and mixed conifer stands (Harvey-Eightmile EIS). During field reconnaissance within the permit boundary, woodpecker activity has been observed only on the south and east facing slopes of German Gulch. This was found within Douglas-fir stands and Hairy Woodpeckers were not specifically identified. In the lodgepole pine stands on the north side of the Gulch, no woodpecker activity was recorded. Surveys specifically for Hairy Woodpeckers were not conducted and no casual sightings were recorded.

Old-growth and Associated Species Including MIS

Old-growth forests provide complex environments valuable to wildlife because of their high biomass, structural complexity, and variety of microsites. Old-growth forests vary in composition and structure depending on the dominant species in the stand. Douglas-fir old-growth is much different than Subalpine fir old-growth.

The project area straddles the boundary between timber compartments 406 and 407. The DNF identified potential old-growth stands for both timber compartments using aerial photos and the timber stand management record system. The DNF used two parameters of the Eastside old-growth definitions (USFS 1992) to determine which stands were identified. The definitions vary according to habitat type and take into account the age of the dominant tree species, the density of large diameter trees, the density of snags, the frequency of broken and dead-topped trees, the abundance of woody debris, the degree of vertical layering, and the presence of gaps and patches. The only components of the criteria we used were large tree diameter and age. This method identifies potential old-growth, but only field review can verify which of these stands have all old-growth characteristics. In addition, timber information was not taken for all stands in the compartments. Some stands that contain large trees may be missing from this analysis. Therefore, this information is an estimate of stands with potential to be or become old-growth.

In this analysis the DNF broke old-growth out into Douglas-fir, lodgepole, and small spruce/subalpine fir according to the age of the stand (Table 3.3). In order to qualify as old growth, Douglas-fir had to be older than 200 years, lodgepole pine older than 150 years, and spruce/subalpine fir older than 160 years. The DNF also delineated Douglas-fir 150 to 200 years old as sites that may hold some old-growth characteristics but do not meet the age criteria. There are 60 stands or 1,898 acres that are old enough to have old-growth characteristics. Some of these stands are adjacent to one another and form complexes of older forest habitats while some single units are scattered across the compartments. These areas range in size from 3 to 260 acres (Figure 1). Older lodgepole pine was the most common potential old-growth type followed by 150-200 year old Douglas-fir, 200+ year old Douglas-fir and spruce/subalpine fir (Table 3.3).

Table 3.3 Acres in Timber Compartments 406 & 407 Suspected to be Old-growth by Species and Age

Species-Age/Compartment(%)	406	407	Combined
Lodgeple Pine 150+	258.02 (50)	816.53(59)	1074.55(57)
Douglas-fir 150-200	63.60(0.07)	372.78(27)	376.38(20)
Douglas-fir 200+	174.45(34)	145.55(11)	320.00(17)
Spruce/Subalpine-fir	83.93(16)	43.22(3)	127.15(7)
Totals	520.71(100)	1377.62(100)	1898.33(100)

Suspected old growth made up 15.5 percent of the timbered component of compartments 406 and 407, not including Douglas-fir under 200 years old (Table 3.4). Forest Plan Standards require that 5 percent of each 3rd order drainage must be old-growth. German Gulch drainage is a 3rd order drainage and for the purposes of this document, percentage of old-growth within timber compartment 406 should meet this standard.

Table 3.4 Percent of Old-growth* by Species Within Timber Compartments 406 and 407

Compartment	406		407		Combined	
Species	Total	% Old Growth	Total	% Old Growth	Total	%Old Growth
Lodgepole Pine	3890	6.7	3354	24.3	7244	14.8
Douglas-fir	739	23.6	444	32.8	1183	27.1
Spruce/Subalpine-fir	781	10.8	612	7.1	1393	9.1
All Species	5410	9.6	4410	22.8	9820	15.5

*This analysis portrays the most optimistic percentages within the compartments. These stands do not necessarily have all the characteristics that define old-growth.

Current mine exploration has impacted one Douglas-fir old-growth stand. This stand has been field verified and meets the eastside Douglas-fir old-growth criteria. A series of exploration roads has been constructed through this 37 acre stand, and some 200-300 year old trees have been removed. Currently, this stand is being fragmented by roads. If an ore deposit is located within this area the entire stand will be removed (USFS, 1991, 1992).

The Northern Goshawk has been identified as an indicator species for old-growth habitats on the DNF. However, goshawk population trends are also of concern because of declining numbers. As a result, the U.S. Fish and Wildlife Service has listed them as a Category 2 Species under the Endangered Species Act. (See Threatened, Endangered, and Sensitive Species discussion for discussion of Category 2.)

Northern Goshawk (*Accipiter gentilis*)

Goshawks are forest raptors. They prey on squirrels and forest birds and typically nest in stands of mature and old-growth forest larger than 25 acres (Warren 1990). Nesting habitats have consistently been described as mature to old-growth forest stands (Reynolds 1978, Hennessy 1978, Hall 1982, Saunders 1982, Hayward 1983, Crocker-Bedford 1990). Both single and multi-storied stands with relatively open understories are used (Dietzen 1978, Hennessey 1978, Shuster 1980, Hall 1982).

Goshawks select nesting trees large enough to accommodate a substantial nest structure. Hayward (1983) found goshawks in the northern Rockies using nest trees averaging 20 inches dbh. Douglas-fir and western larch are preferred nesting trees in this region (Warren 1990). Nest sites most frequently occur toward the bottom or on the lower 1/3 of gentle slopes (Hayward and Escano 1989), and they are often located next to small canopy openings that provide a flight path to the nest (Hayward 1983).

Ideally, foraging stands should be at least 2500 acres in size (Reynolds 1983). Crocker-Bedford (1990) described prime goshawk foraging habitat as extensive stands of large trees with dense canopy and open understory. Population densities of goshawks in western North America vary widely depending on the distribution and extent of suitable habitat.

These estimates range from one pair per 525 acres in Wyoming (Craighead and Craighead 1956) to one pair per 6800 acres in Oregon (Reynolds and Wight 1978). Crocker-Bedford (1990) has suggested managing for about 5000 acres of prime habitat per nesting pair.

The Beal's Hill area does have adequate habitat for northern goshawks to forage and reproduce. The mature-to-old forest component of timber compartments 406 and 407 covers 79 percent of the forested area. Specific analysis for goshawk habitat within the timber compartments was not conducted because of time constraints. Analysis was confined to land within the permit boundary. Within the permit boundary there were 37 acres of open grown old-growth habitat that had potential as nesting and foraging habitat. This is the Douglas-fir old-growth stand described above. Goshawks were not surveyed for and were not seen during field reconnaissance. The South Beal Project location supports mostly small diameter dense lodgepole pine with a myriad of exploration roads already in place. It is not suitable habitat for goshawks.

Grassland and Associated Species Including MIS

There are 2,869 acres of dry grassland in timber compartments 406 and 407. Approximately 7.8 percent of that grassland is within the permit boundary. Grasslands within the permit boundary are not grazed by domestic livestock, and if not altered by current mine operation, are available to grassland associated wildlife species (Appendix A).

The DNF has listed the Montane Vole as a Management Indicator Species for mountain grassland habitat (FP V-6).

Montane Vole (*Microtus montanus*)

The montane vole is found in natural bunchgrass communities interspersed with forested stands on south and east-facing slopes (Harvey-Eightmile EIS, 1991). They require overhanging grass as cover and building material for tunnels. Grass is also a primary food source (Burt and Grossenheider 1978). Within the permit boundary, 91 acres of dry grassland habitat exist. About 133 acres of the original grasslands have been converted to roads and bare soil due to mine activities. Studies on the Mount Haggin Game Range 3 miles to the north of the permit boundary documented montane voles in the grasslands (R. Douglas, pers. comm. 1991). Because of the condition of the grasslands within the permit boundary and the proximity of known populations of this species, it is reasonable to assume that this species is present in the project area. Habitat is not present in the proposed South Beal Project area. There have been no population surveys for montane voles conducted and no casual observations recorded within the permit boundary.

Specific Species of Interest

Elk

According to the original EA for this area (USFS 1988) the High Rye Elk herd unit, a component of the larger Fleecer/Mount Haggin herd, is about 500 animals during the winter. This herd winters in the Beefstraight Creek and Norton Creek areas and summers around Beal's Hill. High use summer habitat also includes the Greenland Gulch area. Prior to the current mine activity, Beal's Hill was a elk calving area. Since the mine operation began, calving has shifted away from the mine site. The Beal's Hill area still offers transitional range during the fall and because the habitat within the permit boundary is closed to hunting, elk are commonly found within the area during the hunting season. The habitat not directly impacted by mine activity continues to be occupied by elk.

The DNF Plan provides two indices for measuring elk habitat effectiveness: elk use potential (EUP) and elk effective cover (EEC). Elk use potential is a measure of hiding cover and assumes that a ratio of 40 percent cover to 60 percent open habitat is an optimal balance. This is defined as 100 percent EUP. Elk effective cover is determined by multiplying EUP by a factor derived from open road density (habitat effectiveness). A EEC of 100 percent is optimal.

This area is within Elk Hunter Recreation Opportunity Unit (EHROGA) #20. The Deerlodge Forest Plan sets minimum hiding cover at 36 percent, minimum EEC at 70 percent, and the maximum road density at 0.5 mi/mi^2 for this unit (Forest Plan N-7).

Existing hiding cover in this EHROGA is at 39.5 percent and road density is at 0.40 mi/mi^2. This combination creates an EEC within Forest Plan standards (Table 3.5). Road density currently calculates only those roads open during the hunting season. If the area is analyzed according to the terms of a 1988 settlement agreement reached with appellants to the DNI plan, closed roads receive 0.25 weight in the road density equation. Then this area has a road density of 0.59 mi/mi2.

Table 3.5 Hiding Cover and Road Density Calculations for the High Rye EHROGA - Beal Mountain Mine Analysis

EHROGA	Existing High Rye	Minimum Forest Plan Standards
Acreage	26,470	-
% Hiding Cover	39.5	36
% Elk Use Potential	100	95
Total Road Density (mi/sq.mi)	1.2	no standard
Open Road Density (mi/sq.mi)	0.4	0.5
% Elk Effective Cover	81	70

A security area, by virtue of its geography, topography, vegetation, or a combination of these factors, will hold elk during periods of stress (Lyon and Christensen 1990). The security area concept was designed to provide elk with enough cover and seclusion during the hunting season to allow a desired number of mature bulls to escape harvest.

Hillis et al (1991) defined the objectives for security areas as 1) Maintaining the current, relatively unregulated 5-week hunting season; 2) distributing the bull harvest evenly over the entire hunting season; and 3) maintaining a desired level of mature bulls in the post-hunting season population.

Currently, no hunting is allowed within the permit boundary. Elk have become somewhat habituated to the mine operation, and do use remaining habitat within the permit boundary. This habitat is functioning as a security area for this herd unit. Within the High Rye EHROGA 82 percent of the forested cover is more than 1/2 mile from a road.

Mule Deer

According to the original EA (USFS 1987), mule deer concentrations in the area are moderate. It provides year-round habitat for mule deer, and the ridge below the mine site is excellent deer habitat. The current mine activity probably displaced mule deer from the immediate vicinity of disturbance, but deer are still present within the permit boundary and use the hillsides adjacent to the mine including the site where the South Beal Project is to be located.

Blue Grouse and Spruce Grouse

Blue Grouse and Spruce Grouse are reverse migrants moving from high elevation to low for summer and low elevation to high during winter. Insects and forbs are eaten during spring/summer, berries are added during fall, and conifer needles are the main food source in winter.

Both Blue Grouse and Spruce Grouse occupy the area around Beal's Hill year round. The leach pad for the current mining operation is situated on spring/summer habitat for grouse where broods were raised (USFS 1988). The South Beal Project site may provide winter habitat for these species.

Threatened, Endangered, and Sensitive Species

Threatened, endangered, and sensitive species are characterized by low populations that are often erratically distributed. As a result, they play diminished roles in the natural communities of which they are a part. Because of their sensitivity to human activities and to changes in the landscape, they are the components most likely to be lost from the system. Biological diversity suffers as a result.

Threatened and endangered species are listed and monitored by the U.S. Fish and Wildlife Service. An *endangered* species is one that faces the possibility of extinction throughout all or a significant portion of its range. A *threatened* species is one that is likely to become endangered in the foreseeable future. A *candidate* species is one being studied for listing (category-1 = species for which substantial data is available; category-2 = species for which data is being gathered).

Sensitive species are not covered under the Endangered Species Act and are not administered by the USFWS. They are designated by the Forest Service (the Regional Forester in each region), and are species for which population viability is a concern. Downward trends in population numbers or in habitat capability (either observed or predicted) are evidence of viability problems.

There are 8 threatened, endangered, and sensitive wildlife species known or believed to occur in the project area (Table 3.6). One Category 2 species, the Northern Goshawk was dropped from this section. It is analyzed separately and carried through the document as an old-growth Management Indicator Species. More detailed information on threatened, endangered, and sensitive species is documented in the Biological Assessment found in Appendix A.

Table 3.6 Threatened, Endangered, and Sensitive Species Known or Believed Likely to Occur in the Beal's Hill Area

Common Name	Scientific Name	USFWS Status	USFS-R1 Status
Peregrine Falcon	Falco perengrinus	Endangered	Endangered
Bald Eagle	Haliaeetus leuco-cephalus	Endangered	Endangered
Lynx	Lynx canadensis	Candidate-2	Sensitive
Fisher	Martes pennanti	None	Sensitive
Boreal Owl	Aegolius funereus	None	Sensitive
Flammulated Owl	Otus flammeolus	None	Sensitive
Townsend's Big-eared Bat	Plecotus townsendi	Candidate-2	Sensitive
Black-backed Woodpecker	Picoides arcticus	None	Sensitive

FISHERIES

The proposed project area is within the German Gulch drainage. German Gulch supports a pure strain of west slope cutthroat trout. Westslope cutthroat trout populations were estimated in 1984 at 525 fish 6-10 inches in length per mile of stream near Beefstraight Creek and 230 westslope cutthroat 6-10 inches in length per mile of stream near Edward Creek. Field reviews conducted in 1988 indicated that fish distribution in German Gulch extends upstream into the SE 1/4 of section 33, approximately 1 mile below the permit boundary. Recent observations indicate the presence of fish in the vicinity of water monitoring Station 3A which is located just upstream of the permit boundary. However, species composition, abundance, and extent of upstream distribution has not been documented.

Historic placer mining occurred extensively in German Gulch Creek. This has likely reduced quality of fisheries habitat due to channelization and alteration of of riparian vegetation communities. Despite these historic alterations of habitat, German Gulch supports fish populations similar to those found in nearby streams. Evaluation of stream substrate in 1988, upstream of Beefstraight Creek, yielded measurements of 34.5% cobble embeddedness and 41.6% fine sediment (< 0.25 inch).

RESOURCES WITH NO SIGNIFICANT IMPACTS

Soil Resources

Soils in the proposed amendment area are similar to those found at main Beal and discussed in O.P. 00135, the main Beal operating permit application (Beal Mountain Mining, Inc., 1988) and 1988 Beal EA/PER (Montana Department of State Lands and U.S. Forest Service, 1988). The soils are acidic to neutral with pH values ranging from 4.5 to 7.0. The soil pH values are naturally occurring because of the vegetation community on the site and not related to the presence of the ore body in the area. Vegetation communities in the area of the expansion are adapted to growing on the acidic soils and perpetuate acidic soil conditions. Although a soil pH of 5.0 or less may produce limited revegetation, it is not considered unsuitable for salvage by the agencies.

Vegetation

There are no Threatened or Endangered plant species in the South Beal area. One known sensitive plant species is found within the existing mine operating area; *Juncus hallii* (Hall's rush) was found during Beal Mountain Mine's baseline vegetation studies. Portions of the populations of that species has been protected from disturbance by BMMI. BMMI planted 500 plants of Halls' rush on the mine site disturbances in 1989 as a further mitigation. Neither Hall's rush nor any other sensitive plant species or sensitive plant communities were found during field surveys in 1992 of the South Beal proposed expansion.

Air Quality

BMMI already has an air quality permit for the Beal Mountain Mine. The Air Quality Bureau has previously modified the air quality permit to accommodate this mine expansion (Air Quality Permit #2472-02, issued February 18, 1992).

Recreation

The Beal Mountain area is classified in the Forest Plan, Chapter III-54, as E1 and A6 management areas which, under recreation, allows for the construction of trails and facilities that provide access to adjacent areas. The Beal Mountain area was inventoried using the Recreation Opportunity Spectrum, a system designed to inventory, analyze, and manage forest recreation settings and opportunities. Under this system, the Beal Mountain area was inventoried for rural and roaded natural setting classification where resource modification

and utilization practices are evident, but harmonize with the natural environment. This is characterized by broad, rounded, and smooth mountain ridges and narrow v-shaped valleys. Vegetation habitat types consist of Douglas-fir, Englemann spruce, and subalpine fir.

Trail #94 accesses the area on the north side of German Gulch and continues around the perimeter boundary of the Beal Mountain Mine. The trail continues south across Greenland Gulch and connects to the Continental Divide National Scenic Trail. Hunting is the primary recreational activity in the area. Hunters access the area mainly by off highway vehicles or horseback.

Most of the trail is not within sight of the proposed project area. Hunters primarily use German Gulch to access the Greenland Gulch area. The South Beal expansion is within the permit boundary of the mine which means it is currently off limits to recreational uses.

Cultural Resources

The project area is in the German Gulch Historic Mining District. Extensive cultural resource inventory of German Gulch and the proposed project area began in 1981 when BMMI began mineral exploration and contracted with Mineral Research Center of Butte, Montana to conduct cultural resource investigations (Fredlund, 1990). Further inventory took place as exploration increased and culminated in the development of the Beal Mountain Mine. Cultural resource inventory reports produced from surveys conducted in the German Gulch area include: Fredlund, 1990; Herbort, 1988; Herbort, 1984; Fredlund and Anderson, 1984; Steer, 1982. Each of the above surveys, in whole or combination, covered all of the potential impact area for the South Beal Project. Fredlund's 1990 report not only covers mitigation, but gives valuable information about the entire historic district. In addition, as part of project monitoring and field investigations, the DNF archeologist has walked over the entire project area.

Extensive adverse effect to major contributing elements of the historic district by road construction at main Beal resulted in GCM Services being contracted by BMMI to mitigate impacts, through a series of test and mitigation excavations, in order to retrieve valuable archaeological information. The mitigation also included archival research into the history of Chinese and Euroamerican placer mining. The resulting mitigation report *Archaeological Investigations In the German Gulch Historic District (24SB212): An Historical Chinese Placer Area in Southwestern Montana*, presents good artifact analysis and discussion of placering techniques. Please see the above referenced report for additional details.

CHANGES FROM DRAFT TO FINAL
SOUTH BEAL PROJECT EIS

CHAPTER IV

Spelling corrections and editing which did not change the meaning of sentences are not identified as changes to the Draft EIS.

Chapter IV changes reflect the dismissal of several issues as well as a substantive addition to the environmental consequences of the the proposed action and it's alternatives.

The issues that were not carried forward in the Final EIS include the stability of the South Beal Project pit walls, the effects of adding the South Beal ore on the leach pad and the fisheries issue. The reasons why these issues were not carried forward in the Final EIS can be found in Chapter II under Issues Dismissed from Further Study.

In addition, the effects analysis in Chapter IV was expanded to reflect the additional monitoring and mitigation measures identified in Chapter II under Alternative 2. Additional analysis was completed from information that was not available at the time of the Draft EIS.

Specific Changes include but are not limited to the following:

Table 4.1 Past Present, and Foreseeable Actions in the Beal's Hill Area - minor acreage changes were made.

"Wetlands"

The Final EIS reflects that references wet areas are not "jurisdictional wetlands" and were associated with a previously permitted haul road downslope from the South Beal pits.

Alternative 1-Effects on Groundwater

The DEIS statement "If water infiltrates into backfilled pits, sulfates could be produced and enter grounderwater" has been mitigated in the Final EIS. Sulfate, regardless of source, would be prevented from entering groundwater by prompt reclamation/revegetation of the pit backfill material.

Alternative 1-Groundwater-South Beal Pits

The statement in the DEIS that "If the South Beal pits do contribute nitrates to the groundwater, it would be at the same rate that nitrates are released at main Beal because the rate of blasting would be the same" has been corrected in the Final EIS. A major portion of the rock within the South Beal pits will be ripped rather than blasted which will not result in nitrate release.

Effects on Fisheries Habitat

The Final EIS clarifies ongoing fisheries surveys however, this is discussed in Chapter II under Features Common to All Alternatives.

IV - ENVIRONMENTAL EFFECTS

This chapter discloses the potential effects of the alternatives discussed in Chapter II on the resources described in Chapter III and forms the analytic basis for the comparison of alternatives in Chapter V. The chapter is organized by affected resource.

GEOLOGY

1. ALTERNATIVE 1 THE SOUTH BEAL PROJECT

"In the western United States, many precious metal deposits contain sulfide as well as alkali or buffering minerals. The resultant buffering capacity of these alkali minerals can result in long lead times before acidic drainage is detected. The resultant drainage may be near neutral pH, but with elevated metals concentrations remaining in solution" (Robertson et al, 1992). Geochemical characterization of all rock types associated with the South Beal amendment was conducted to help evaluate direct and indirect effects of the proposed plan on water quality in the mine area. Formation of acid rock drainage is a complex process. The long-term chemical nature of solutions resulting from water leaching through spent ore and waste at mining properties depends on a variety of chemical reactions. The most important reactions affecting mine water quality are the oxidation of iron disulfides, formation of acid, the release of metals, and the dissolution of buffering minerals which can neutralize, decrease or delay acid production.

Geochemical characterization

The rocks associated with the South Beal deposit consist of quartzite/hornfels, marble and a very minor amount of diorite. The quartzite/biotite-hornfels rock makes up about 92 percent of the total overburden waste rock from the South Beal deposit. Approximately 7% is a fine grained cale-silicate limestone or marble. A portion of the waste is iron oxide stained quartzite. Due to the presence of pyrite, pyrrhotite and iron disulfides associated with the deposit, the potential for acid production exists. Geochemical material characterization tests for the main Beal and South Beal deposits indicate a low potential for acid formation. However, the release of sulfates and metals into surface waters is still considered to be a possibility. These substances could become mobile regardless of acid production. If acid rock drainage were to develop over time the consequences would have long-term impacts on German Gulch. Those long-term impacts are discussed in the section on Surface Water in this Chapter.

Methodology

A number of geochemical tests performed by BMMI were used to estimate the water quality impacts of the various South Beal deposit materials. Trace element analyses were conducted for 2 quartzite waste samples, 3 marble waste samples and 4 South Beal ore samples to determine trace element abundance. The observed concentration of these trace elements/metals in sedimentary rocks above background levels is common for mineralized areas (Horn et al, 1966).

EPA Method 1310 tests (E.P. Toxicity) were conducted on the same selected samples. E.P. Toxicity analyses were used to evaluate whether or not any substantial amounts of regulatory agency-controlled metals would be leached under this testing protocol. E.P. toxicity analysis is also used to classify waste as hazardous or not hazardous. Water quality may be impacted at lower levels than those given as maximum contaminant.

Samples of ore and waste rock from the South Beal deposit and spent ore from the main Beal leach pad were tested for their acid producing potential using the modified Sobek method, a static test, in which the acid producing potential of a rock is compared to the neutralizing potential (Reclamation Research Unit, MSU and Schafer & Associates, 1987). The acid neutralizing potential (ANP) minus the acid producing potential (APP) is defined as the Acid-Base Account (ABA). Another method of evaluating the potential for acid production is to establish the ratio of ANP/APP. If the ratio is greater than 3, it is generally accepted by the scientific community that the risk for eventual acid production is very low (Robertson et al, 1992).

A kinetic test is a type of leachate extraction test. Acid, sulfate, calcium, magnesium, zinc and manganese production during kinetic tests are indicators of acid producing potential. Kinetic tests define reaction rates for both metal dissolution and acid generation through time under specific conditions. Reaction rates are used as input parameters for qualitative math models which can reliably extrapolate kinetic test results beyond the time of the tests. These qualatative models are currently being used by the agencies to help evaluate the physio-chemical relationships in the hydrological system around the mine area.

South Beal Waste

Trace element analyses were performed on three South Beal marble waste samples and two quartzite waste samples. Although trace element analyses indicated slightly elevated concentrations of trace elements/ metals in the rock, the corresponding leachate extraction tests did not indicate any potential for metals release into the environment.

BMMI conducted static tests on twenty-two South Beal waste rock diamond drill core samples: twelve for quartzite waste, six for marble waste and four for iron oxide quartzite waste. These samples were taken from what would eventually be the exposed highwall and pit floors. The samples were chosen on a skewed basis with some samples being chosen specifically for their higher iron sulfide content. The results of these tests were not meant to represent weighted volumes of the South Beal waste material. All but one waste rock sample had ABA values near or above zero, suggesting the lack of potential to produce acid.

The ANP/APP ratios showed that all marble waste samples and iron oxide waste samples had an ANP/APP of greater than 3, indicating a very low risk of any acid formation. Kinetic testing affirmed the static test results; results demonstrate that the marble waste from the South Beal deposit would not produce acid and could even act to neutralize waste material blended with it. This is the same material which could be used to isolate or cap potentially acid-producing waste.

Approximately 92 percent of the South Beal waste material is quartzite waste. The marble waste comprises approximately 7 percent and and remainder is diorite. For the quartzite waste, 75 percent of the samples had an ANP/APP of greater than 3, based in the selected worst case samples. Results from the static testing could not confirm that all quartzite waste would be non-acid producing. Therefore, kinetic testing, using humidity cells, was conducted for 15 weeks. Sulfate was initially released but eventually levelled off at the end of 15 weeks of testing (Beal Mountain Mining, 1992a). These results also indicate the South Beal quartzite waste would not be acid producing. Average volume weight ABA values for South Beal waste are:

Rock Type	Description	Tonnage%	ABA average
quartzite/FeOx	waste	92.24	+7
marble	waste	6.98	+101.3
diorite	waste	0.78	no info.

Main Beal Waste

Currently, sulfate concentrations in springs emanating from below the main Beal waste rock dump are increasing. This could either be due to dissolution of gypsum incorporated in the rock, dissolution of soil amendments, application of a sulfate used for chemical dust abatement, or the oxidation of iron disulfides and the subsequent production of sulfates. Ongoing water monitoring results will indicate which scenario is most likely. The agencies are closely monitoring sulfate concentrations and are working with Beal to reevaluate the characteristics of the main Beal waste. Samples of main Beal waste with higher sulfide content were chosen to test a worst-case scenario. Static tests showed that the potential for acid generation exists for these samples. Kinetic tests, initiated in May, 1993, are ongoing. Test results will be evaluated at the end of 20 weeks of testing.

South Beal Ore

Trace element results conducted on four South Beal ore samples indicated trace element/metal compositions for arsenic, barium, chromium, copper, iron, manganese and zinc were elevated above background levels.

Leachate extraction tests using EPA Method 1310 were conducted on the same four South Beal ore samples. This leachate extraction technique was used to evaluate if any substantial amounts of regulatory controlled metals would be leached under this testing protocol. After the extraction, no leachate samples had concentrations of metals above regulatory limits for this test. Results indicated that metals mobility should be minimal.

Six ore samples were taken from diamond drill core from the South Beal deposit from the proposed pit wall and floor. Static tests were conducted on these samples. The volume weighted average ABA for South Beal ore is +5.4. The static test results suggest an uncertainty as to whether acid formation from ore would eventually become a concern. Kinetic tests were not done on fresh ore from the South Beal deposit because the ore would be limed in the agglomeration process, prior to cyanidation and results could be inconclusive.

Main Beal Spent Ore

Trace element analyses were not done on main Beal spent ore. Static tests were done on three spent ore samples taken from the main Beal leach pad. Results from these tests again suggest an uncertainty as to whether sulfate release and metals leaching would eventually become a concern.

To help resolve this uncertainty, kinetic testing was conducted for 15 weeks on the main Beal spent ore samples using humidity cells. Three cells were constructed: 1) whole spent ore, 2) less than 2mm diameter spent ore, and 3) greater than 2mm diameter spent ore. All humidity cell samples released sulfate during the initial leaching cycles suggesting that gypsum, hydrated calcium sulfate accumulated during processing, was being released. Unlike tests done for waste samples, sulfate continued to be released for all three spent ore samples, indicating a possibility for oxidation of iron disulfide.

A chemical analysis of humidity cell leachate extracted after the ninth week of testing indicated the possibility of arsenic mobility. The leachates were not analyzed for metals at the end of testing. Therefore, testing results were inconclusive regarding the potential for metals mobility.

No samples tested produced an effluent with a pH lower than 8.13 after 13 weeks of testing. However, the pH trend analysis for the spent ore sample of greater than 2mm indicated a substantial drop in the last 2 weeks of testing from 8.24 to 6.4.

2. ALTERNATIVE 2 THE SOUTH BEAL PROJECT WITH MODIFICATIONS

Geochemical Characterization

The agencies would have more data to identify sources of potential contamination. Monitoring the interior of the waste rock facility and field and kinetic tests would help define the potential for and sources of contaminant leaching.

Neutral waste from the South Beal deposit would be stockpiled and used to cap potentially reactive waste placed on the main Beal waste rock facility. Main Beal waste would be used as backfill material. If main Beal waste is found to be reactive, BMMI would cap the backfill material with neutral material before final placement of soil and eventual reclamation. This should isolate any potentially reactive rock from infiltration.

3. ALTERNATIVE 3 THE NO ACTION ALTERNATIVE

Geochemical Characterization

The No Action alternative would result in no change from current conditions. Ore and waste being mined from the main pit would be monitored for acid producing potential using the geochemical characterization plan discussed in the South Beal proposal. Although not part of the main Beal permit, if Alternative 3 were selected, the Agencies would require BMMI to use the characterization plan in the South Beal proposal.

The high-neutralization-potential marble waste from the South Beal area would not be available for blending with or isolation of any potentially acid-producing wastes from the main pit.

4. CUMULATIVE GEOLOGY IMPACTS FOR ALL ACTION ALTERNATIVES

Geochemical Characterization

Waste

The cumulative effect of Alternatives 1 or 2 would be to help define sulfate sources and to improve reclamation capping of the main Beal waste dump and possibly the leach pad, using neutral waste from South Beal or main Beal.

The addition of the South Beal waste rock to the waste rock dump would not increase the potential for acid rock drainage because South Beal waste is not expected to produce acid or release contamined leachate. In fact, the addition of the South Beal marble/neutral waste rock could provide neutral material used for capping to help isolate any potentially leachable contaminants. The cumulative effect of Alternatives 1 or 2 for the waste dump would be to decrease infiltration of water into the dump and to buffer any acidic water that might be produced.

If monitoring of the interior of the already existing main Beal waste rock facility indicates oxidation of iron disulfides as the source for the sulfate production, the addition of main Beal waste rock as backfill material into the South Beal pits could provide a new source of potentially acid generating material into the South Beal pit area. However, the potential to produce contaminated leachate from the South Beal pit area is substantially reduced for three reasons: 1) BMMI has committed to testing the backfill material before placing it in the South Beal pits and segregating any acid producing material and not placing it in the pits. 2) the proposed pit floor lies above the current water table in the South Beal area, and 3) the pits would be sequentially backfilled and therefor isolated.

Reasonably foreseeable development at the property includes taking the main Beal pit 200 feet deeper, and generating an additional 1.5 million tons of waste rock. Any nitrate or sulfate problems emanating from the waste rock would be accentuated proportionally by this additional waste.

Ore

There would be minor cumulative effects from the addition of the South Beal ore to the main Beal ore. Static and kinetic results suggest that the main Beal and South Beal ore could release sulfates and metals.

For spent ore, arsenic, zinc, manganese and other metals are mobile under a greater range of pH and an additional mass of arsenic would be supplied to the heap. Since the leach pad is on a lined surface and the effluent would be controlled, the effects of deposition of additional arsenic or other metals on the leach pad would be minor for the short-term. For the long-term, the permitted land application disposal (LAD) system has demonstrated that all metal levels including arsenic are successfully attenuated (Schafter et al, 1992a and Beal Mountain Mining, Inc., 1988). If the capacity of the process facility is reached, this system is already in place. BMMI can treat excess process water and release it within the permit boundary close to Beal's Hill (Figure 3).

The reasonably foreseeable deepening of the main Beal pit would generate an additional 4.5 million tons of ore. This would require a new amendment. Any leachate effects added with this additional ore would be cumulative with those resulting from the main and South Beal ore and would be addressed in an environmental analysis for the new project.

Stability

The addition of the South Beal ore to the leach pad heap does raise some concern for the stability of the Gully fault slump in the main Beal pit, which is adjacent to the leach pad heap (Seegmiller, 1992). The leach pad has been reconfigured to avoid impact from the slump. The slump has been stabilized by BMMI by dewatering the pit wall material. If the slump does move again the leach pad heap should not be affected unless the slump cuts into the mountain farther than predicted. Regardless of how the slump reacts in the future, the addition of South Beal ore to the heap would not worsen the consequences.

5. CONSISTENCY WITH THE DEERLODGE NATIONAL FOREST PLAN

Alternatives 1 and 2 are consistent with the Deerlodge National Forest (DNF) Plan with regard to testing and handling of ore and waste from the South Beal pits. Alternatives 1 and 2 are also consistent with regard to ground stability concerns with the South Beal pits and haul road. Alternative 3 would not allow construction of the South Beal pits. Present operations are consistent with the DNF Plan with regard to testing and handling of ore and waste and ground stability.

GROUND AND SURFACE WATER QUALITY

The South Beal pits and any materials disposed of in the pit are a new and enlarged source under the Montana Water Quality Act nondegradation policy and therefore are subject to nondegradation provisions of surface and ground water rules. South Beal waste rock and ore, both of which would be placed in existing permitted facilities, *might* not be subject to nondegradation because they are within the volume and rate of production (tons per year) established in the original DSL and USFS permit. Current operational problems with water quality at BMMI indicate that nonpoint sources of degradation such as sediment, nitrate, and sulfate, are not controlled with the use of BMMI's existing Best Management Practices or mitigations. BMMI is now determining the sources of nitrate and sulfate in order to identify additional management practices for control (Schafter et al, 1992b and 1992c).

1. ALTERNATIVE 1 THE SOUTH BEAL PROJECT

Ground Water

Impacts to ground water from mining the South Beal deposit are expected to be minimal. The South Beal pits would only be open one year and would have little if any effect on ground water. The water table under the proposed South Beal pits is 25 to 50 feet below the estimated levels of the pit floors, so, ground water would not come in contact with backfilled waste from main Beal. The South Beal monitoring wells would be used to verify that no degradation occurs (Figure 3).

The South Beal pits would be backfilled with main Beal waste. Static tests for main Beal waste indicate a potential for acid production. To test a worst-case scenario, samples with higher sulfide content were chosen. Kinetic tests for these samples have been initiated (May, 1993) and results are pending.

There is an unresolved concern regarding sulfate release from main Beal waste rock which would be used to backfill the pits. Current changes in water quality of Spring 5, which discharges from beneath the main Beal waste rock facility, indicate that main Beal waste may contribute sulfates to ground water. However, the sulfate source is uncertain. Other potential sources include the use of mulch, dissolution of sulfate minerals, and oxidation of iron sulfides in main Beal waste (Schafer et al, 1992b, 1992c).

Successful reclamation of backfilled waste rock would minimize any potential for impacts to ground water from release of sulfates by reducing the rate of weathering and the amount of infiltration into the groundwater. Reclamation and revegetation would reduce infiltration into the groundwater by increasing evapotranspiration. Buffering by the marble bedrock within the proposed pit floors would reduce the potential for contaminant leaching into ground water below the South Beal pit area by buffering the hydrological system.

Arsenic occurs within the South Beal deposit and is discussed in Chapter 3 of this EIS. Arsenic is least soluble in the near-neutral (pH 7) range, and becomes increasingly soluble if the pH decreases or increases. Solubility of arsenic within the South Beal deposit could increase if the pH of the ground water in that area deviates from near-neutral conditions. However, a change in pH sufficient to mobilize arsenic is extremely unlikely. (Please see geochemical discussion in this chapter.)

Surface Water

Main Beal Waste Rock Facility

South Beal waste rock would be placed in the existing waste rock facility. The concentration of nitrates and sulfates released from the waste rock pile could continue to increase during the addition of the South Beal waste, but the rate of their increase is not expected to accelerate as a result of the South Beal project. The rate of placement of waste rock within the waste rock facility would not change with the South Beal Project. The ultimate size of the waste rock facility would decrease slightly because approximately one million tons of waste from main Beal would be used to backfill the South Beal pits after mining is completed at South Beal.

Humidity cell tests indicate that South Beal waste would not be acid-generating. However, there is still a possibility of sulfate release from South Beal waste rock. Results from kinetic tests indicate that sulfate release would be expected to decrease through time. Bmmi has proposed to dispose of any water which collects in the pits by using it for irrigation on reclaimed portions of the waste rock facility or other areas. If this pit sump water used for irrigation contains elevated concentrations of nitrates and sulfates, this could increase nitrate and sulfate loads in springs below the waste rock facility.

South Beal Pits

No surface water exists within the South Beal pit areas. Hypothetical pathways between the proposed South Beal pits and surface water include surface runoff and groundwater flow between the pits and German Gulch. Because mining of the main Beal pit requires more blasting than mining at South Beal would, the main Beal pit is considered to be a potentially greater source of nitrate contamination than the South Beal pits would be, yet monitoring has not identified the main Beal pit as a nitrate source. The South Beal pits would be higher on the hillside above German Gulch than the main Beal pit, and the pits would be smaller. Therefore, the potential that nitrates from the South Beal pits would discharge to groundwater and ultimately reach surface water in German Gulch is very low. After pit reclamation, surface runoff from reclaimed, fertilized areas could carry nitrates to German Gulch; however, because of the distance involved and BMPs designed to control runoff, this is not expected to occur.

Impacts to aquatic communities from the South Beal pits would likely be minimal since these pits would not discharge to either ground or surface water, so ambient water quality would be maintained. BMMI is drafting an instream biological monitoring program. This monitoring program would allow documentation and quantification of impacts from increased sediment or decreased surface water flows, as well as the impacts of the current operation on biological communities.

Main Beal Heap

As discussed in the geology section of this chapter, sulfates are expected to be released from the South Beal ore, but pH of water is expected to remain neutral. If South Beal ore were to start producing acid or harmful effluent, BMMI has committed to a contingency plan, described in Chapter II, to mitigate the problems. The heap is part of a zero discharge circuit, and would not release any water to surface water during its operation. Upon decommissioning of the leach pad, neutralized water would be land applied prior to reclamation of the pad.

Roads

The 600 feet of new road could contribute some sediment to German Gulch. However, the new road is about 600 feet from German Gulch and any surface water runoff would be filtered through the forest. Properly applied BMPs should minimize or prevent sediment from reaching German Gulch surface water.

2. ALTERNATIVE 2 THE SOUTH BEAL PROJECT WITH MODIFICATIONS

Ground and Surface Water

Because the mining of the pits in the proposed South Beal project would be completed in such a short time, increased frequency of submittal of water quality data, (Alternative 2 in Chapter 2), would allow the agencies to review monitoring reports during mining. This would allow the agencies to respond to water quality changes in a more timely manner if a problem surfaces during the mine life. If trend analyses or the waste rock monitoring program indicate the a problem, remedial actions would be taken. These include the addition of lime to the waste rock, segregation of waste material and/or capping of waste rock or heap leach facility at closure to prevent infiltration. Post-reclamation monitoring would verify that long-term impacts to water quality would not occur.

During mine operations, the concentration of sulfate released from the waste rock facility would be similar to that discussed in Alternative 1. Nitrate concentrations in surface water would be lower than those discussed in Alternative 1 as a result of implementation of mitigations #1 and #3a, 3b 4,6 and 7 described in Alternative 2, Chapter II. Sulfate laden water would be mitigated as discussed in Alternative 1.

If results of water quality analyses indicate it is necessary, the agencies would review BMMI's reclamation and mitigation plans, pursuant to Section 337 of the Metal Mine Reclamation Act. This review allows the agencies to revise a mine's permitted reclamation plan to provide for the use of Best Available Technology (BAT) to achieve the goals of final reclamation. Revisions could consist of more or larger water diversion structures, increased monitoring, and/or revised capping sequences for the major facilities left in the area. These revisions would reduce the rate of oxygen diffusion into the interior of the facility and the amount of water which could potentially seep through the facility and be released to surface water and/or groundwater. This would reduce the potential for acid rock drainage.

Biological monitoring stipulated by the agencies and discussed in more detail in Chapter 2, would help assessment of the current conditions and detect impacts from the proposed expansion in addition to monitoring by the current chemical monitoring program alone. The biological integrity of German Gulch would be assessed relative to background conditions. Biological monitoring would also document the effectiveness of BMMI proposed Best Management Practices (BMPs) to control nonpoint source pollution.

3. ALTERNATIVE 3 THE NO ACTION ALTERNATIVE

Ground Water

The EA/PER in 1988 (Montana Department of State Lands 1988 and U.S. Forest Service, 1988) determined that the development of the main Beal pit would have minimal impact on water quality and surface flows in German Gulch in the long term. As predicted, water quality has changed in the short term. Nitrate, sulfate and TDS levels have increased since mining began in 1988. Nitrate and sulfate levels have exceeded the drinking water standard in some monitoring wells. Nitrate and sulfate concentrations may continue to increase even if the South Beal project is not permitted. As discussed under Alternative 1, nitrate and sulfate sources are not certain.

The selection of the no action alternative would prevent any potential impacts from the South Beal project. However, the neutralizing waste rock from South Beal would not be available to cap the main Beal waste rock facility in case of waste rock acidification. Under this alternative, the ultimate size of the waste rock facility, as permitted, would be larger than under Alternatives 1 or 2 because main Beal waste would not be used for backfill at South Beal.

Surface Water

The EA/PER in 1988 determined that increased sediment production would have no measurable or long-term impact on German Gulch. However, water quality has changed. Increased concentrations of TDS, nitrates and sulfates have been detected in Spring 5 below the waste rock facility. Because this spring discharges to German Gulch, BMMI has installed water collection and pump-back facilities below this spring to capture all the water and reduce impacts to the water quality of German Gulch. If Alternative 3, the No Action Alternative, is selected, the neutralizing waste from South Beal would not be available to cap the main Beal waste dump in case of acidification.

Biological monitoring is would be required under this alternative. (See the section on Chemical Characterization earlier in this chapter.)

4. CUMULATIVE HYDROLOGICAL IMPACTS FOR ALL ALTERNATIVES

Ground Water

The cumulative impacts of each of the three alternatives are described in Chapter III, the Existing Environment. Since the impacts of the proposed South Beal project are expected to be minimal, the cumulative impacts under Alternatives 1 and 2 are expected to be minimal.

Surface Water

Potential cumulative impacts to surface water resulting from approval of any of the alternatives include increased sediment, TDS, sulfate and nitrate loading to German Gulch.

Nitrate concentrations have exceeded standards in Spring 5 downgradient of the waste rock dump. Possible sources include ANFO, fertilizer, mulch and slash and burn sites. Sulfate concentrations have exceeded drinking water standards in Spring 5 downgradient of the waste rock dump in 1992. If the sulfate and nitrate concentrations at monitoring site SPR-5 remain above the standard and if South Beal waste rock releases any nitrates or sulfates at all, standards would continue to be exceeded under Alternative 1, and possibly to a lesser extent in Alternative 2. Implementation of Alternative 2 mitigations should eliminate apparent water quality problems. Diversion of spring 5 should minimize operational water quality impacts to German Gulch.

German Gulch flows into Silver Bow Creek which then becomes the Clark Fork River downstream of the Warm Springs Ponds. Currently, elevated metals impair beneficial uses in about 150 miles of the upper Clark Fork and Silver Bow Creek (Ingman and Kerr, 1990 and DHES, 1992). Approximately 100 miles of the upper and middle Clark Fork rivers are also impaired due to nutrient pollution resulting from elevated concentrations of nitrogen and phosphorus (Ingman and Kerr, 1989a and DHES, 1992). Dense algal mats, caused in part by nitrate loading, reduce dissolved oxygen levels in the river, impair aesthetic and recreational qualities and impede irrigation.

Based on BMMI monitoring, nitrate concentrations in German Gulch have increased relative to pre mine conditions. Data from Station 3A indicate that upper German Gulch's contribution to the nitrate load in Silver Bow Creek has increased from 0.017 percent to 0.78 percent (in 1991) since BMMI began operations. This represents an increase of from 24.4 to 1,116.6 pounds per year between 1988 and 1992. Limitations of available data preclude accurate assessment of the relative contribution of nitrogen from the mine to the Clark Fork River. However, between Ramsay and Warm Springs, Silver Bow Creek carries an estimated annual load of 142,454 pounds of nitrate (Ingman, 1992).

Preliminary 1993 data indicate that nitrate loads in German Gulch have declined as a result of diversion of Spring 5. In the spring of 1992, the concentration of nitrate in upper German Gulch at Station 3 averaged 5.0 mg/L (5.3 mg/L in March and 4.7 mg/L in July). In contrast, the nitrate concentration reported for Station 3 in May of 1993 was 1.24 mg/L. Not enough data for 1993 is available to determine if this apparent improvement will continue.

Modification of current practices, diversion of contaminated springs, and implementation of BMP should reduce German Gulch's contribution to the nitrogen load in Silver Bow Creek.

BMMI has an ongoing exploration program in the mine vicinity which has cumulative impacts with main Beal, and would have cumulative impacts with South Beal. This program includes drilling, trenching, and access road construction. All of this activity increases the sediment producing potential within the drainage. Proper road design, construction and maintenance techniques would assure that cumulative impacts from exploration would be minimal.

There are no expected cumulative impacts to fisheries under any of the alternatives as discussed in Chapter II, Issues Considered but Dismissed From Further Discussion.

5. CONSISTENCY WITH THE DEERLODGE NATIONAL FOREST PLAN

Alternative 1 is not be consistent with DNF plan. Alternative 2 is consistent with the DNF Plan with regard to protection of and impacts to ground and surface water. Since alternative 3 would involve no work at the South Beal site, the ongoing activities at main Beal are consistent with the DNF Plan with regard to protection of and impacts to ground and surface water.

WILDLIFE

1. BIODIVERSITY-ALL ALTERNATIVES

This section examines the impacts that the proposed action and the alternatives would have on biological diversity in the Beal Mountain Mine area. Direct, indirect, and cumulative effects on wildlife are analyzed. The analysis of cumulative effects for this project will consider the past, present, and foreseeable future actions occurring in the German Gulch area (Table IV-1). For landscape analysis, other projects within the Fleecer range may also be included.

Table 4.1 Past, Present and Foreseeable Actions in the Beals Hill Area.

Action	Location	Acres	Year	Method
Beal Mtn. Mine	German Gulch	425	1988	Open Pit/Roads,Heap Leach
Mining Exploration	German Gulch	5	89-90	Road Building
Mining Exploration	German Gulch	10	91-92	Road Building
South Beal Expansion	German Gulch	25	93	Open Pit/Roads
Mining Exploration	German Gulch	1	93	Road Building
Mining Exploration	American Gulch	0	93	Helicopter

The Fleecer Mountain Landscape

The action alternatives would remove approximately 25 acres of lodgepole-dominated habitat from the north-facing German Gulch slope. This would produce a slight and temporary shift from mature lodgepole pine forest to a seedling/sapling site two years after mining in Alternatives 1 and 2. The no-action Alternative 3 would produce no change. The two action alternatives would not affect the overall landscape pattern of the Fleecer Range.

German Gulch Vegetation Patterns

Effects to the landscape would be temporary. Once the pits are backfilled and reclaimed, the function and utility of the landscape would begin return to pre-mining conditions. The pit area would be replanted with trees of seedling/sapling ages. Alternative 3 (No Action) would not convert the timber on this slope. However, as discussed in Chapter III, the existing exploration roads would still compromise the site for wildlife habitat. Alternatives 1 and 2 would temporarily alter local landscape patterns, and Alternative 3 would maintain a roaded layout on the landscape that does not resemble a natural pattern. Once the roads are reclaimed, the alterations from this activity would be evident in this landscape for several decades and becoming less pronounced over time.

Edges

The Fleecer Landscape naturally occurs as a mosaic of open range interspersed with forested areas. The action alternatives would not change the typical "abrupt" edge pattern of the Fleecer Range. Under Alternatives 1 and 2 edge effects would be temporary and would gradually blend back into the unaffected landscape as the planted trees and vegetation mature. In Alternative 3, the exploration roads would be reclaimed and recontoured and the high density of unnatural edge would be reduced. Consequently, the wildlife value of this hillside would not be irreversibly altered.

Regional Corridors

Neither of the action alternatives alone would have an effect on habitat corridors needed by large and wide ranging species (See Wildlife Biological Assessment).

Landscape Linkages

Neither of the action alternaitves would prevent wildlife movements with German Gulch or across this landscape.

Riparian Areas and Associated Species Including MIS

The action alternatives would permanently remove some forested wet areas that are less than one acre. The loss of these sites might have impacts on species with low mobility but would have little effect on species that are able to leave the area. The wet areas along the hillside are currently compromised by the numerous exploration roads that crisscross the site. No jurisdictional wetlands exist in the South Beal amendment area.

Lodgepole Pine/Douglas-fir and Associated Species Including MIS

Both action alternatives would remove about 25 acres of mature lodgepole pine habitat. Alternatives 1 and 2 would temporarily convert the site to a seedling/sapling stand after mining. Lodgepole pine is an abundant species throughout the area and this project would reduce this component in timber compartment 406 from 7,244 acres to 7,218 acres - a loss of 0.4 percent. The removal of 0.4 percent of mature lodgepole pine in compartment 406 would not negatively effect Hairy Woodpeckers or other wildlife species using this forest type. Temporary displacement during the activities on the site would occur as well as some use alterations of surrounding areas; both effects are to minimal to measure.

Old-growth and Associated Species Including MIS

There would be no effects on old-growth or associated wildlife species as a result of the action alternatives.

Grassland and Associated Species Including MIS

There are would be no effects on grasslands or associated wildlife species as a result of the action alternatives.

2. SPECIFIC SPECIES OF INTEREST-ALL ALTERNATIVES

Elk

Both action alternatives remove 25 acres of cover for elk. Although this would reduce the amount of cover from 39.5 percent to 39.4 percent, EEC would remain at 81 percent (Table IV-2). But because this area is closed to elk hunting the EEC model does not accurately reflect project activities effects on elk. More important to elk survival is whether this action displaces elk outside of the security area (i.e. permit boundary) and into areas accessible to hunters. In either case, elk displacement from Alternatives 1 and 2, would be a temporary condition because the pits would be backfilled and the roads reclaimed. Reclamation would create a grassy opening until the seedling trees begin to grow. Elk would not likely be negatively affected by either action alternative.

Table 4.2 Hiding Cover and Road Density Calculations for the High Rye EHROGA - Beal Mountain Mine Analysis

	Action Alternatives	Existing High Rye	Minimum Forest Plan Standards
Acreage	26,470	26,470	-
% Hiding Cover	39.1	39.5	36
% Elk Use Potential	100	100	95
Total Road Density (mi/sq.mi)	1.2	1.2	no standard
Open Road Density (mi.sq.mi)	0.4	0.4	0.5
% Elk Effective Cover	81	81	70

Mule Deer

Both action alternatives would cause some displacement of mule deer from the site of alteration. However, adequate habitat does exist on the perimeter of the permit boundary and on the outside of the boundary for mule deer to occupy. This action would not negatively affect mule deer.

Blue Grouse and Spruce Grouse

Both action alternatives would remove some winter habitat for these species. However large areas of habitat are available in all directions from the mine site. This action would not negatively affect these species use of German Gulch or the Fleecer Landscape.

Threatened, Endangered, and Sensitive Species

Potential effects from all three alternatives, on threatened, endangered, and sensitive species are summarized briefly here (Table 4.3).

Table 4.3 Summary of Effects on Threatened, Endangered, and Sensitive Wildlife Species Observed or Suspected to Occur in the Beal's Hill Area

Species	Status	Alt.1	Alt.2	Alt. 3
Peregrine Falcon	E	NE	NE	NE
Bald Eagle	E	NE	NE	NE
Lynx	E	NE	NE	NE
Boreal Owl	S	NLAA	NLAA	NE
Fisher		NE	NE	NE
Flammulated Owl	S	NLAA	NLAA	NE
Townsend Big-eared Bat	C2/S	NLAA	NLAA	NE
Black-backed Woodpecker	S	NE	NE	NE

Effects Notation

NE-No Effects
NLAA-Not likely to adversely affect

Status Notation

S-Sensitive Species
E-Endangered Species
T-Threatened Species
C2-Category-2 Candidate Species

An "effect" under the Endangered Species Act (1973) is a result that would (1) jeopardize the continued existence of a threatened or endangered species or (2) adversely modify its habitat. The Forest Service Manual (FSM 2672) extends these criteria to sensitive species as well, and adds the condition that viable population levels be maintained.

In Table 4.3, the agencies determined that an alternative would have "*no effect*" if (1) suitable habitat was not being eliminated or radically modified, (2) the species was assumed not to be present in the *project* area, (3) human disturbance during mining operations was highly unlikely to affect species behavior or habitat use, or (4) no increase in human disturbance was expected as a result of the project. The agencies concluded that an alternative was "*not likely to adversely affect*" if (1) suitable habitat was affected, but replacement habitat was readily available, (2) no key habitat components were radically modified, (3) the species was likely to be able to adapt behaviorally to disruption during mining, or (4) not enough information was available to reach a conclusion of "no effect" with reasonable certainty.

3. CUMULATIVE WILDLIFE IMPACTS-ALL ALTERNATIVES

The Fleecer Mountain Complex

Within the 50,000-acre Fleecer Landscape, this action would add to altering the vegetation patterns of the north end of this landscape. Either action alternative, in and of itself would not negatively alter landscape-wide functions. However, these proposed activities in connection with past, present and possible future activities could eventually alter landscape functions from what occurred historically (USDA For. Serv., Case Studies of Silviculture in the Landscape, 1992).

German Gulch Vegetation Patterns

Roads are constructed in most of the major drainages, including German Gulch. Many of the streams/riparian zones have been modified by mining and cattle grazing. Alternative's 1 and 2 would have a temporary impact on the German Gulch hillside. In connection with the existing mine, this action widens the area of impact at the head of German Gulch while the disturbance occurs. This project, in addition to the existing mine, would further alter the local landscape patterns. Currently, approximately 400 acres do not resemble any natural landscape feature or pattern that originally existed. The configuration of vegetation at the head of this drainage has been altered and at least part of the area (main Beal pit, old-growth stands) cannot be rehabilitated to pre-project patterns in the short-term.

Regional Corridors

Past and present actions, as they relate to large and wide ranging animal movements in the regional landscape is difficult to assess. Historically fewer people and habitation in the valleys enabled these species to travel, migrate and disperse through a variety of areas now unavailable. These action alternatives in addition to past and ongoing actions is not expected to negatively alter regional corridor use. Future sightings of wolves and grizzly bears will always be used in future analyses.

Landscape Linkages and Wildlife Movements

The existing mine has already altered wildlife movements. Elk use has changed. Currently during the hunting season, this area is used as a security site. During the calving season elk must find alternative sites to give birth. Wildlife moving up the drainage as an avenue into the Fleecer Range now skirt around the headwaters area which is directly impacted by mine activities. Habitat on either side of this drainage is suitable to absorb species movements and a linkage between or among habitats is not completely blocked because of these activities.

Migratory birds would not likely be affected and probably would avoid the site. However, there is a possibility that they may be attracted to the holding ponds. No incidences of such occurrences have been reported. If birds ever are attracted to the holding ponds mitigation measures such as netting over the ponds should ensure that birds do not land on them.

Edges

A discussion of edges and their importance is contained in chapter 3. The mine itself has obliterated the edge pattern between an open grassland park and the forested stringers surrounding it. It has not invaded interior habitats in a substantial way, and after reclamation, the edge pattern of the area, although different, would not be out of the historical range of variation seen in the Northern Rocky Mountain Ecosystems. The exploration roads have invaded forested stands and are widening the "edge effect" around the mine site. This is currently true for the stands to the east of the mine and to the south. Future exploration into the American Gulch area could further invade interior habitats if road building and tree removal are included.

Riparian Areas and Associated Species Including MIS

German Gulch was impacted by historic mining prior to the start of the existing mine. The current mine has removed about 4 acres of streamside vegetation, mostly by road construction. The original EA/PER states that the area the leach pad now occupies contained many seeps and springs (USFS 1988, p.44). This type of habitat is very attractive to wildlife in a juxtaposition with cover and forage. The current mine activity has rendered approximately 190 acres of grasslands with scattered wet areas and forested stringers permanently unavailable for species that require or select for wet meadow type sites (such as the Western Jumping Mouse).

The Greenland Gulch drainage to the south and the Beefstraight Gulch drainage to the north have suitable riparian habitats available to wildlife. Greenland Gulch is remote and relatively untouched. Beefstraight has been impacted by mining and livestock grazing but still contains adequate shrubby riparian sites to attract wildlife species that require that type of habitat. Small wet meadow openings (less than 10 acres) are scattered throughout both drainages.

Lodgepole Pine/Douglas-fir and Associated Species Including MIS

The existing mine has eliminated about 130 acres of lodgepole pine and Douglas-fir habitat. This is about 1.5 percent of the lodgepole pine/Douglas-fir component of timber compartment 406 (Lodgepole pine = 3,890 acres, Douglas-fir = 739 acres). An additional 37 acres of old growth Douglas-fir habitat and 40 acres of lodgepole pine habitat has been impacted by exploration roads (Exploration EA, 1992). Proposed exploration into the American Gulch area would impact additional forested habitat. While roading does not remove the entire timber stand it does alter the character of the stand changing wildlife species use.

Old-growth and Associated Species Including MIS

The connected actions of this project include the exploration roads that radiate from the mine center. Several of these roads extend to the east of the mine and dissect a 37-acre Douglas-fir old-growth stand (Exploration EA 1992). The quality of this patch is currently lessened and the loss of this stand reduces the estimated Douglas-fir old-growth component of Compartment 406 from 174.45 acres to 137.45 acres, a decline of 21 percent. Most of the large old trees were avoided during road construction in the event that the roads would be obliterated and the stand could recover an unentered quality sooner than if they were removed. If the exploration discovers a mineable ore body, this stand would be completely removed. An estimated 23.6 percent of the Douglas-fir in timber compartment 406 is old-growth. The removal of this stand reduces that percentage to 18.6 percent, and the total old-growth component for the timber compartment from 9.6 percent to 9.0 percent. This is within the forest plan standard that requires 5 percent of each third order drainage to be old-growth.

This stand represents the only area within the permit boundary that is suitable as goshawk foraging and nesting habitat. However, the exploration roads have probably made this unavailable for the present. Available sites outside the boundary are located especially in the Greenland Gulch area which contains a large unfragmented block of forested habitat (>5,000 acres).

Exploration into American Gulch would impact approximately 40 acres of old-growth spruce/subalpine fir habitat in the upper end of the drainage. Adverse effects to this stand would be expected if road construction and exploration were conducted.

Grassland and Associated Species Including MIS

The existing mine removed about 133 acres of high elevation meadow. This habitat is no longer available to grasslands species. Reclamation after the mine life should restore part of this site however, in the short-term, the vegetative species mix would not resemble the composition on the site before the mine. Exploration has not seriously impacted grassland sites.

Montane voles do not occupy the impacted habitat however it is likely that they occupy the remaining grasslands within the permit boundary.

4. CUMULATIVE IMPACTS TO SPECIFIC SPECIES OF INTEREST-ALL ALTERNATIVES

Elk

The EA/PER for the original mine (Montana Department of State Lands and U.S. Forest Service, 1988) predicts that the existing mine "... has the potential to displace elk and stress wintering animals." It also states that "The calving area on top of Beal's Hill will be eliminated and the suitability of the area as calving habitat [will be] severely impacted after mining....Elk migrations will be affected by the human activity on Beal's Hill." No specific monitoring of the elk herd has been conducted to determine how this disturbance has affected it. However, it is known that: elk calving has shifted from the Beal's Hill area, elk do use the permit area as a refuge during the hunting season, elk do not appear to be more stressed during the winter (in part due to mitigation measures), and the productivity of the herd has not declined (M. Frisina, pers. comm. 1993). It is unknown where elk calving now occurs or how transitory animals react to the disturbance. The additional disturbance of the South Beal Project added to the current disturbance of the existing mine and exploration should not likely adversely affect the elk herd.

Mule Deer

Mule deer have been displaced from the impacted acres of the current mine and exploration sites. However they have habituated to the activity to some degree and are commonly observed around the perimeter of the mine site. The mule deer population has not been adversely affected by the past action and future actions, although impacting more habitat, would not likely adversely affect this species.

Blue Grouse and Spruce Grouse

The existing mine has affected distribution of blue and spruce grouse in this area. The leach pad is situated on a brooding area and destroyed about 186 acres of habitat. The birds had to find alternative sites for brood-rearing, but there have been no monitoring efforts to discover their fate. It is unknown how the mine has affected the grouse population in the area. The outward spreading of the mine with the proposed action and the current and future exploration continues to remove available habitat from the head of German Gulch. Habitat to the north and the south is still relatively intact and could provide refuge for those individuals displaced from German Gulch. It is unknown how these activities have affected seasonal migration of these birds.

5. CONSISTENCY WITH THE DEERLODGE NATIONAL FOREST PLAN

All alternatives are consistent with the Deerlodge National Forest Plan with regard to protection of and impacts to wildlife.

D. RESOURCES WITH NO SIGNIFICANT IMPACTS

Please see summary of these resources in Chapter 3.

E. COMMITMENT OF RESOURCES

Selection of Alternatives 1 and 2 would result in the mining of the South Beal pits and would be an irreversible and irretrievable commitment of 959,840 tons of ore which would be removed from the South Beal pits and placed on the main Beal leach pad. Irreversible and irretrievable commitment of resources from Alternative 3 are discussed in the 1988 EA.

V - Response Summary

This chapter includes public comments to the Draft EIS and the agencies' responses. Five letters were received. Substantive comments from each letter are numbered, and corresponding agencies' responses are given.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII, MONTANA OFFICE
FEDERAL BUILDING, 301 S. PARK, DRAWER 10096
HELENA, MONTANA 59626-0096

Ref: 8MO

May 24, 1993

Margie Ewing
Deerlodge National Forest
Box 3840
Butte, MT 59702

Mike DaSilva
Montana Department of State Lands
Capitol Station
Helena, MT 59620

Re: South Beal Project
Draft Environmental Impact Statement

Dear Ms. Ewing and Mr. DaSilva:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Environmental Protection Agency, Region VIII, Montana Office (EPA) has reviewed the above-referenced Draft Environmental Impact Statement (DEIS).

Beal Mountain Mining Incorporated (BMMI) proposes the development of two open pits and associated road construction in the German Gulch drainage for the extraction of gold and silver. These activities are within the permit boundary of their existing Beal Mountain Mine operation and would utilize the existing heap, waste rock dump, and other mine facilities. The DEIS analyzed three alternatives including the proposed action, the proposed action with mitigation of mine-related impacts, and a no action alternative. No preferred alternative was identified in the DEIS.

After a preliminary review of the DEIS, EPA identified some basic concerns, and scheduled a meeting in Helena on May 6, 1993 to discuss these concerns with Deerlodge National Forest (DNF) and Montana Department of State Lands (MDSL) staff. The concerns regarded apparent degradation of water quality in the German Gulch drainage since the Beal Mountain mining was initiated, and additional degradation that could result from activities proposed with the South Beal mine expansion project. The DEIS indicated since initiation of mining activities total dissolved solids (TDS), sulfates, and nitrates changed considerably in springs, groundwater, and German Gulch Creek monitoring stations, and that sediment delivery to German Gulch had occurred. The DEIS indicated

that activities associated with the South Beal Project expansion were expected to contribute further to these conditions. As a result of these discussions EPA was given additional reports and information, and an additional two weeks to review the DEIS and additional information. The new information provided to EPA included:

1. A copy of the "Geochemical Behavior of Sulfate: Potential Source Identification at the Beal Mountain Mine" report prepared by Shafer and Associates, consultant to Pegasus Gold Company. This report was prepared to evaluate the increasing sulfate levels detected during water monitoring at the Beal Mountain Mine.

2. A copy of "Biogeochemical Behavior of Nitrogen: Potential Source Identification at the Beal Mountain Mine" report prepared by Shafer and Associates, consultant to Pegasus Gold Company. This report was prepared to evaluate increasing nitrate levels detected during water monitoring at the Beal Mountain Mine.

3. A copy of the draft "Beal Mountain Mining Operational Mine Waste Sampling and Geochemical Assessment Plan" for evaluating acid rock drainage potential at the mine.

4. A copy of the original Environmental Assessment for the Beal Mountain Mine.

5. A copy of the MDSL mine permit application for the Beal Mountain Mine Project.

6. A copy of the South Beal Amendment to the MDSL Beal Mountain permit application, Volumes I and II.

7. The "Beal Mountain Mine 1992 Annual Hydrological Monitoring Report" prepared by Hydrometrics, Inc., dated May 1993.

EPA's review of the additional information evidenced that efforts have been made to monitor, assess, and mitigate water quality degradation at the Beal Mountain Mine. EPA, however, still has concerns that the water quality degradation that is occurring at the mine may be an early indicator of acid rock drainage water quality problems. Water quality trends show increasing concentrations of TDS, sulfate, nitrate and the presence of dissolved metals in some spring and ground water samples. These problems could present serious long term threats to water quality and fisheries in German Gulch Creek.

Based on our review of the DEIS and additional information showing increasing concentrations of TDS, sulfate, and nitrate, and the presence of dissolved metals in water samples the EPA considers it to be essential that the DNF and MDSL include an expanded monitoring and mitigation plan in Alternative 2 that identifies specific levels or conditions of specified parameters that, when

reached, would require explicit contingency actions to be taken by the company and/or agencies. Such an action plan should be made a part of any State and Federal permits authorizing operations at the Beal Mountain Mine to ensure that ground and surface water resources and fisheries are protected.

The EPA has determined that there are known potential adverse environmental impacts associated with heap leach mining operations. The existing mining operation has apparently led to increased levels of pertinent water quality parameters and the proposed activities have the potential to add to those increased levels. In addition, there is insufficient information presented in the DEIS to determine what environmental impacts are expected to occur, and what measures will be taken to ensure protection of the ground and surface water resources with implementation of any of the alternatives considered. Based on these findings, and in accordance with EPA criteria for rating a DEIS, this DEIS has been rated as category EO-2 (Environmental Objections - Insufficient Information).

Attached are detailed comments that led to our determination as well as EPA's rating criteria. If you have any questions regarding our input, please contact Steve Potts at (406) 449-5486.

Sincerely,

William E. Ergh

for John F. Wardell, Director
Montana Office

Enclosures

cc: w/enclosures Phyllis Williams, 8WM-EA
" Bob DeSpain/Wes Wilson, 8WM-EA
" Tom Rhode/Ann Puffer, Forest Service Region 1
" Tom Reid, MDHES - WQB
" James L. Hagemeier, USFS, Northern Region

ATTACHMENT

DETAILED COMMENTS BY EPA REGION VIII ON SOUTH BEAL DEIS

Following are specific comments related to information in the DEIS and the additional information that led to EPA's concerns:

1. Chapter III, page 18, indicates that total dissolved solids (TDS), sulfates, and nitrates in German Gulch have changed considerably since baseline monitoring in 1987 and 1988. It is stated that the increase in TDS is related to activities in the main Beal pit and the waste rock pile. The increase in sulfate may be the result of oxidation of sulfide minerals in the main Beal waste rock pile or dissolution of sulfate minerals and hydromulching. 1-1

Chapter III, pages 19-21, indicates that nitrate concentrations in surface and ground water have increased relative to baseline conditions in the vicinity of the main Beal project. In addition, several samples have shown nitrate levels above Montana Water Quality standards. Page 19 states; "Nitrate concentrations may be due to fertilization of the waste rock embankment." (emphasis added) Chlorophyll and periphyton monitoring appears to indicate that aquatic community composition in German Gulch Creek may be changing in response to the nitrogen increase. 1-2

Field investigations have also shown that construction activities in the vicinity of the mine have contributed sediment directly to German Gulch. A survey in 1988 yielded measurements of 34.5 percent cobble embeddedness and 41.6 percent fine sediment. Apparently no subsequent monitoring has taken place. 1-3

2. It is stated on page 36 of the DEIS that leachate extraction tests using EPA Method 1310 were conducted to evaluate the potential for leaching of metals from South Beal ores. EPA recommends that in the future EPA Method 1312 should be used for such evaluations. EPA Method 1312 uses unbuffered stronger acids for the extraction process. This would provide a better measure of the potential for leaching of metals if acidic conditions develop. 1-4

3. Also on page 40 of the DEIS, the source of water quality concern is listed as an unresolved concern with potential sources identified as the use of mulch, dissolution of sulfate materials, or oxidation of sulfides. The source of these materials includes, at least in part, the waste rock dump, the leach pad on the north side, and the leach dump on the south side, which have had nitrate concentrations exceeding the Montana Water Quality standard for nitrate in ground water of 10 mg/L (DEIS, page 19). These sources are mine point sources 1-5

subject to the effluent limitation guidelines provisions of 40 CFR part 440. Therefore, the FEIS should indicate that BMMI should apply for a Clean Water Act (CWA) MPDES permit for runoff, seepage, and discharge from operations at the mine site. There is potential that existing mine discharge/runoff/seepage is not in compliance with the CWA.

4. Several statements are made throughout Chapter IV that raise concern over potential adverse impacts and the ability to mitigate those impacts. Such statements include: 1-6

page 39; "The South Beal ore is geochemically similar to the main Beal ore and it is reasonable to assume the South Beal ore, after cyanidation and agglomeration, would also release sulfate and arsenic." 1-7

page 40; "Water quality results from springs discharging below the main Beal waste rock dump indicate that main Beal waste may contribute sulfates to ground water. 1-8
However, the sulfate source is uncertain. Potential sources include the use of mulch, dissolution of sulfate minerals, and oxidation of sulfides. If water 1-9
infiltrates into the backfilled pits, sulfates could be produced and enter ground water."

page 41; "S. Beal waste will report to the Main Beal Waste Rock Dump. The concentration of nitrates and sulfates released from the waste rock pile may continue 1-10
to increase with the addition of the South Beal waste, but the rate of their increase is not expected to change."

"Humidity cell tests indicate that South Beal waste would not be acid-generating. However, there is still a possibility of sulfate release from South Beal waste 1-11
rock. Results from kinetic tests indicate that sulfate release would be expected to decrease through time. Any excess water would be pumped to a sump in the pit and used for sprinkling of the waste rock pile or for irrigation. This may increase nitrate and sulfate loads in springs below the waste rock dump, and possibly nitrate and sulfate concentrations."

"If the South Beal pits do contribute nitrates to ground water, it would be at the same rate that nitrates are 1-12
released at main Beal because the rate of blasting would be the same."

"Impacts to aquatic communities from the South Beal pits would likely be minimal since these pits would not discharge to either ground or surface water. Ambient water quality would be maintained or pumped and treated.

Increased chemical monitoring would ensure that nutrients, TDS, and metal concentrations do not increase above current levels." 1-13

Based on these statements, it is reasonable to expect further contribution of contaminants with the South Beal expansion. The EPA is concerned that additional impacts may occur from the increased activity associated with the South Beal project. 1-14

5. Page 51 of the DEIS states;

"However, if additional water quality concerns necessitate complete diversion of flows from Springs 5 and 3, the cumulative reductions in flow in German Gulch may reduce winter habitat capability upstream of Station 2A (approximately 1 mile below the permit boundary)." 1-15

"If water quality changes occur at Springs 5 and 3, the additional water quality data and increased involvement of agency personnel would allow for balancing water quality concerns, water quantity concerns, and concerns to fisheries when addressing diversion of Spring flows. A balance of concerns would reduce potential impacts to winter fish habitat in German Gulch." 1-15

What effect would such a reduction of winter habitat capability have on fish populations, especially pure strain west slope cutthroat trout? What are the relative flows of the relevant springs and of German Gulch? What measures would be taken to balance the concerns? 1-15

6. It is stated on page 21 of the DEIS that "ongoing biological monitoring was not required, therefore, it is difficult to assess if changes in water quality have affected the biological communities in German Gulch Creek." EPA believes that given the water quality concerns, ongoing biological monitoring should be required in order to assess the impacts of water quality changes on the aquatic community in German Gulch Creek. 1-16

7. The inference in the <u>"Geochemical Behavior of Sulfate: Potential Source Identification at the Beal Mountain Mine"</u> report that water quality degradation initially observed at the mine is minimal and temporary is unsupported by the 1992 monitoring data. Elevated concentrations of specific conductance, TDS, sulfate, and for some samples, nitrate and selenium, were reported in four springs (Springs 3, 5, 12 and 12A) in 1992. This increase would tend to refute the inferences that sulfate increases would decline after the high precipitation and elevated alluvium water levels in 1991. 1-17

Also, when the decreased water quality in Springs 3, 5, 12 and 1-18

12A, all of which are downgradient of mine operations, are compared with the water quality of Spring 9, which is upgradient of mine operations and relatively unchanged, it lends support to the concern that mine operations are degrading water quality. 1-18

Also, water quality at German Gulch stations 2, 2A, 3, and 3A in 1992 all show continuing increases in sulfate and TDS in comparison with 1991 data. The farthest upstream German Gulch Site, Station 4 and undisturbed German Gulch tributaries (Edwards Creek and Greenland Gulch), however, do not show further 1992 degradation. This comparison again lends support to the concern that mine operations are degrading water quality. 1-18

In addition 1992 monitoring data shows a trend of increasing concentrations of sulfate and TDS and nitrate in some groundwater samples, and some groundwater samples have shown elevated concentrations of dissolved metals, again lending support to the concern that mine operations are degrading water quality. 1-18

8. The 1992 monitoring data shows the presence of dissolved metals in some spring and ground water samples. The presence of metals in water samples collected at the various monitoring stations is reason for significant concern. Trends in metals concentrations should be monitored and evaluated very closely. 1-19

The following excerpt from, "Prediction, Prevention and Control of Acid Mine Drainage in the Western United States Workshop", A.MacG. Robertson, Steffen Robertson and Kirsten, Breckenridge, Colorado, August 18-21, 1992, is relevant. 1-20

"...In the western United States and Canada many of the sulfide deposits also contain alkali. This can result in a long lead time before acidic drainage is detected. Over the period of time in which oxidation reactions are occurring and the drainage is neutralized by the natural alkali, there are geochemical indications of the extent to which oxidation is occurring, such as sulfate, calcium and magnesium production, which presence, when evaluated, can assist the evaluator in the prediction of the long term acid and dissolved metal generation potential of the material. 1-20

...In the evaluation of drainage water quality for a site, it is critical to recognize that acidic (or low pH) drainage in itself is not the only acid rock drainage issue. Rather, the presence of elevated metal values in the drainage can be of greater concern in terms of environmental impact. Metal values may remain elevated despite neutralization of pH along the flow path (Zn for example). The resultant drainage may be near neutral pH, but with elevated metal concentrations 1-20

remaining in solution... the real interest is in local site pH variations which allow mobilization of metals into the drainage water and thus determine drainage quality."

9. According to data in Appendix A of the "Beal Mountain Mining Operational Mine Waste Sampling and Geochemical Assessment Plan" acid base account testing (ABA) evidenced that a significant number of waste and spent ore samples showed acid producing potential (i.e., eleven of thirty four samples with NP/AP less than three; eight samples with ABA less than 0). **This data does not appear to support the contention in the DEIS Summary (page xi) that acid rock drainage is not expected to occur.** 1-21

Also, we ask whether a connection of the ABA sampling data for the various waste rock and ore sample types in Appendix A can be made to actual volume and tonnage of ore and waste rock handled at the mine? 1-22 What is the volume and tonnage of acid producing waste rock and ore sample types to be processed at the mine? 1-23 It may be that the potentially acid producing ores and waste rock provide more than one third of the volume and tonnage of ores and rock produced at the mine.

10. The "Beal Mountain Mining Operational Mine Waste Sampling and Geochemical Assessment Plan" states (page 2) that routine ore and waste rock sampling will be carried out, and that if 15 percent of samples tested have ABA values of less than 0, a selective handling program will be developed to isolate potentially reactive waste. 1-24 We believe it would be more appropriate to use the NP/AP ratio <3 as the trigger level, which when exceeded by 15 percent of the samples tested triggers a selective handling program to isolate potentially reactive waste to be developed. The ABA sampling of waste rock and ore should be carried out such that the number of samples tested are representative of the volume and tonnage of waste rock and ore processed at the mine.

Probably more important is the fact that the data in Appendix A indicates that the 15 percent trigger point has already been exceeded using either trigger point. 1-24 A selective handling program to isolate potentially reactive waste should be developed at this time. This selective handling program should be described in the FEIS.

11. The report entitled "Geochemical Behavior of Sulfate: Potential Source Identification at the Beal Mountain Mine" includes several statements regarding the source of sulfate that do not appear to be conclusively supported. 1-25 The statement on page 2 that "increases in sulfate in the North Heap Area appear to be related to seasonal flux of infiltration in spring and early summer" does not appear to be conclusively supported since sulfate levels did not return to 1-26

original back ground levels when ground water levels dropped. The 1992 monitoring results show continued increases in sulfate and TDS. The statement on page 3 that "sulfate migration is not indicative of acid migration from the mining facility" does not appear to be conclusively supported.

12. The report entitled "Geochemical Behavior of Sulfate: Potential Source Identification at the Beal Mountain Mine" describes actions taken in response to the sulfate increases including intercepting shallow ground water from the north heap area and using this water in the processing circuit, adding additional ground water monitoring wells to further evaluate this problem, and collecting spring 5 and spring 3 for use as process water. We are pleased to see that actions have been taken in response to monitoring results. We believe, however, that these actions and other potential mitigative or corrective actions (e.g., placing an impermeable liner or compacted clay layer over the waste rock and heap embankment to further reduce infiltration of water; and using crushed limestone to line reaches of German Gulch downgradient of the pit, waste rock dump, and heap leach pad as added precaution to neutralize acid mine drainage that may find its way into the Creek; etc.) and the alert levels which trigger the contingency actions should be incorporated into the contingency plan and mine permits. 1-27

13. It is stated on page 42; "Increased frequency of data submittal,..., would allow the agencies to review monitoring reports while mining is ongoing. This would allow the agencies to respond to water quality changes should they become a problem during mine life in a more timely manner." 1-28

The EPA appreciates that the company and agencies will be increasing monitoring and evaluation. In addition, the DEIS contains the initial features of developing a mine plan with additional environmentally-protective criteria (Alternative 2). EPA is still concerned, however, and believes an appropriate monitoring and contingency-corrective action plan should be developed to ensure that water quality problems are detected and measured so that control of water quality problems can be initiated, corrected or abated prior to approving additional operations. We strongly support the concept that BMMI should be clearly responsible for protecting water quality by reporting monitored conditions which, if exceeded, would lead to triggering certain contingency actions. Alternative 2 should be expanded to include water quality trend analyses and specific alert levels which, when exceeded, would require activation of specified contingency actions for changes to monitoring, mine plan design, or operations. 1-8

Only monitored conditions that exceed specified alert levels

that then trigger contingency actions can be used to assure that water quality concentrations will not exceed current levels. For each mine facility an alert level for specified parameters should be established which would trigger subsequent contingency requirements. Such a progression of contingency actions might include:

A. Increase frequency of monitoring, and analyze and report water quality trends for monitoring stations. 1-29

B. Amend permit to cover increased monitoring requirements and install additional monitoring wells downgradient of interception sites. 1-30

C. Activate pump-back systems to water disposal sites. Separate alert levels would be established for the leach pad, pit, and waste rock piles. 1-31

D. Change operations to use monitoring wells as interception wells to contain contaminated ground water flow. 1-32

E. Begin interception and treatment of surface waters. If treatment is needed, the discharge criteria would be established in the contingency plan and treatment would continue until the clean up as defined in the permit is determined to be complete. 1-33

F. Prohibit mining of acid generating ores, and/or develop selective ore processing/handling program to eliminate risk of water quality degradation from processing of such ores. 1-34

G. Initiate operating permit modifications and bond reclamation amendments to cover changes in reclamation plan. 1-35

H. Cease operations at this site, or particular mine facility, until water quality compliance or some statistically based standard is achieved. 1-36

EPA is developing a contract for a study with a consultant to investigate development of such a monitoring/alert level/contingency-corrective action program in association with another mine (Zortman-Landusky mine). This study may be provide guidance and information that may be applicable to developing a monitoring and contingency plan for the Beal Mountain Mine. We encourage you to contact Mr. Wes Wilson with the EPA Denver Office at (303) 293-1439 to stay apprised of the progress of this study.

14. It is stated on pages 13 and 14 of the DEIS that BMMI is continuing to explore in the vicinity of the Beal Mine and may 1-37

be submitting amendments for future expansions. EPA is concerned about the continuing expansions of the mine when there are indications that water quality problems are developing which are not fully understood. EPA believes a fundamental reevaluation of mine review, permitting, and regulation should occur. A program to develop a mine monitoring plan with alert levels that trigger contingency and corrective action needs to be developed to monitor, assess, mitigate, and prevent and/or correct water quality problems before mine expansions take place. 1-38

15. It is stated on page 45 that the proposed project "will destroy some forested wet areas that are less than an acre in total size" and "the loss of these sites may have impacts on species with low mobility, but will have little impact upon species that are able to leave the area." Are these wet areas jurisdictional wetlands? If so, you should completely analyze and disclose all impacts to the wetland functions and values in the area. Unavoidable adverse impacts to wetlands should be mitigated to achieve a goal of no net loss of wetlands functions and values. 1-39

Response Summary

1) United States Environmental Protection Agency; May 24, 1993

1-1. Comment noted. See Chapter III of Draft EIS. Comparison of trends in water quality at Spring 5 and at German Gulch sampling sites 4, 3, 3A and 2A indicate that the major source of degradation is in the area of the waste rock facility. The main Beal pit does not appear to have any impact on German Gulch water quality. Investigations into the cause(s) of water degradation will continue at Beal. Appropriate remedial measures will be initiated when the causes are determined with greater certainty.

1-2. Nitrate concentrations are discussed in the Draft EIS Chapter III. The extent of nitrate pollution should be clarified: nitrates have only exceeded standards in spring 5 (below the waste rock facility), springs 12 and 12A (north of the leach pad) and shallow alluvial monitoring well SBB-91-29 (upgradient of springs 12 and 12A). The single reported exceedance in well SBB-87-01 (below the waste rock facility) was the result of a typographical error. Other isolated nitrate standard exceedances in groundwater monitoring wells north of the leach pad (42 mg/L at SBB-88-25 in July 1989 and 38.5 mg/L at SBB-87-07 in April 1991) are anomalous and inconsistent with other data for these wells. Wells SBB-91-29 and 91-30 were installed to help identify the cause of degradation of springs 12 and 12A. Although the drainfield was a suspected source, colliform analyses proved negative. These wells could be pumped back, but they go dry rapidly due to the low volume of groundwater in this area. A collection trench and sumps downgradient near springs 12 and 12A recover this degraded water: spring 12 has been dewatered by pumpback of the sump.

Biological monitoring is a component of Alternative 2, the Proposed Plan with Modifications, Draft EIS, Chapter II, pp. 12 and 13.

1-3. Comment is correct. Percent cobble embeddedness hasn't been reevaluated at German Gulch since 1988. The U.S. Forest Service will repeat the survey this year.

1-4. In the September 15, 1992 completeness review of the South Beal application, the Department of State lands requested that BMMI use EPA Method 1312 for future leachate extraction tests. BMMI explained that the 1310 test were done several years ago, prior to adoption of method 1312, and agreed to use EPA Method 1312 for all subsequent testing of waste rock and spent ore.

1-5. Much of this comment on the DEIS constitutes programmatic oversight comment outside the scope of an EIS. The purpose of an EIS is to disclose the effects of a proposed plan on the human environment-not to provide enforcement guidance to agencies. Similarly, although CEQ regulations ask that permits which must be obtained be identified (CFR 1502.25(b)), it is inappropriate for EPA to require the agencies to list the MPSED permit as a requirement in the DEIS, when the decision that a discharge permit was needed was not made until the close of the comment period on the draft.

The agencies recognize that EPA has multiple authorities and responsibilities. However, under CFR 1503.3(a) comments are to address the adequacy of the statement or the merits of the alternatives or both. Therefore, EPA must retain clear lines between their programmatic responsibilities and the appropriate scope of NEPA comments.

Further, the EPA has misquoted the Draft EIS. The sources of nitrate contamination do not include northern and southern portions of the leach pad; rather, regions of elevated nitrate concentration occur to the north and to the south of the leach pad. The source is not within the leach pad, but may be associated with reclamation or other activity adjacent to the leach pad. The Montana Water Quality standard for nitrate in groundwater has only been exceeded in a small area north of the leach pad, and in a spring which flows from beneath the waste rock facility. BBMI is applying for an MPDES permit.

1.6 This comment contains restatements of observations and predictions made in the DEIS. One purpose of an EIS is to analyze possible environmental consequences. Chapter IV of the DEIS discussed the probabilities of any of these occurrences. Most of the potential impacts which the EPA has identified as concerns are associated with Alternative 1, BMMI's proposal. Alternative 2 was developed by the Deerlodge National Forest and the Department of State Lands with the express purpose of mitigating these potential impacts. The differences between alternatives will provide decision-makers with clearer choices.

1-7. The possibility of sulfate and arsenic releases were issues raised in scoping; see DEIS p.viii. Under Alternative 2, release of arsenic or sulfate from the leach pad will be prevented by delaying perforation of liner until it is assured that appropriate Montana Water Quality Standards can be met for the long-term. See DEIS, Chapter II- p.12, stipulation 4.

1-8. Documentation of all pertinent sulfate and nitrate draft source studies were sent to the EPA (refer to EPA letter of May 24). The agencies (DNF and DSL) have reviewed these draft source studies and found that they weren't conclusive about nutrient or sulfate sources. Additional information was requested, and further studies are ongoing. Updated reports are expected to be available in the fall of 1993.

1-9. The statement in the DEIS is misleading. The text has been revised. The proposed plan provides for backfilling and reclamation of the South Beal pits the year after commencement of mining. Sulfate, regardless of source, would be prevented from entering groundwater by prompt reclamation/ revegetation of the pit backfill material.

1-10. This concern is focused on Alternative 1, the company's Proposed Action. Refer to mitigation provided in Alternative 2 of the DEIS, Chapter IV. p.42. Stipulation 6 provides for capping of the waste rock facility which will decrease infiltration and subsequent seepage from Spring 5.

1-11. This concern is focused on Alternative 1, the Proposed Action. Refer to mitigation provided in Alternative 2 of DEIS, Chapter II, p.11. Stipulation 1 requires that water from South Beal pit sump either be returned to the processing circuit or treated by land application or other appropriate methods.

1-12. The DEIS was incorrect. A major portion of the rock within the South Beal pits will be ripped rather than blasted. Ripping will not result in nitrate release. This correction is made in the FEIS.

1-13. This concern is focused on Alternative 1, the Proposed Action. Refer to stipulation 5, the biological monitoring plan on pp. 12 and 13, DEIS, Chapter II.

1-14. Comments 1-6 through 1-13 were derived from Alternative 1, the Proposed Action as presented by BMMI. Each of these concerns was addressed in developing Alternative 2, as discussed in the DEIS. The EPA is correct that these additional impacts may result from implementation of Alternative 1. If the EPA does not feel that the potential impacts associated with Alternative 1 are acceptable, the EPA should recommend the selection of a different alternative.

1-15. The DEIS is incorrect. No fishery existed upstream of Station 2A when the fish survey was conducted in 1984. Fish have since been observed as far upstream as Station 3A (approximately 1 mile downstream from spring 5, and 1 mile upstream of station 2A); additional studies in 1993 will update fish population data.

Data from 1989 indicated that Spring 5 contributed 20% (73 gpm) of the average flow at Station 3 (upstream of any fish habitat) in German Gulch. Spring 3 contributed approximately 1.5% (5.8 gpm). The percent contribution of spring 5 increased to 23% in 1990 and 29% in 1991. The increase in spring flow may be related to the increased storage capacity associated with growth of the waste rock dump.

1-16. Refer to Stipulation 5, DEIS, Chapter II, pp.12-13. The aquatic biological monitoring program would be required as a stipulation to permit under Alternative 2. Sites would be chosen in the field to represent sections of homogeneous stream reaches.

1-17. Refer to response 1-8. The agencies agree that the draft sulfate source study is inconclusive. Extended studies are ongoing. Interim reports are expected to be submitted in the fall, 1993. Construction activity associated with the approved (1988) mine plan (e.g. roads, waste facility expansion) continued in 1992, and large precipitation events occurred. Therefore, the noted trends in water quality do not prove that the conclusions of the draft sulfate source investigation are erroneous.

1-18. The EPA's comments agree with observations contained in the DEIS, Chapter III, pp. 18-21. However, the EPA is incorrect regarding the position of Spring 9. The spring is located downgradient of the leach pad.

1-19. The agencies agree with EPA's concern. All future water quality monitoring data is stipulated to be sumitted in hard copy and also entered in the EPA STORET database. See DEIS, Chapter II, p. 11, Stipulation 2. This will facilitate independent analysis of trends.

1-20. The agencies agree with SRK's discussion. Ongoing monitoring will evaluate trends in metals mobility. Stipulation 6, DEIS, Chapter II, p.13, requires monitoring of the interior of the waste dump to determine if sulfide oxidation is occuring. If sulfide oxidation is found to be occurring, Stipulation 7 requires BMMI to segregate waste rock and cap the waste rock facility. This will increase isolation of the reactive waste to oxygen and water and decrease infiltration into the facility.

1-21. The agencies agree that ABA testing indicated potential for acid production from South Beal waste and spent ore. The samples were not randomly selected samples. Samples with higher sulfide content were purposely taken to test a "worst-case scenario. Volume weighted ABA's are:

Rock Type	Description	Tonnage%	ABA
quartize/FeOX	Waste	92.24	+7
marble	Waste	6.98	+101.3
diorite	Waste	.78	n/i
quartize	Ore	100.00	+5.4

Kinetic testing (humidity cells) was conducted to better evaluate this risk.

Kinetic data as provided in the South Beal Permit Application (Volume 2, Appendix B, dated April 23, 1992) indicates that waste from South Beal waste will not produce acid.

No kinetic testing has been done on unprocessed South Beal ore. Tests on spent, agglomerated Main Beal ore show, "Sulfate continued to be released for all three spent ore samples, indicating a possibility for oxidation of iron disulfide"., DEIS, Chapter IV, p.37.

1-22. The samples analyzed for geochemical evaluation were not randomly selected. These samples represent a "worst case" for each dominant lithology of waste rock in the South Beal Pit. As a consequence, the number of static test samples is not directly correlated with the volume of each rock type. Table 1 indicates the dominant rock types in waste rock to be renerated from the South Beal Pit.

Humidity cell tests were run one or more "representative" and "worst case" samples for each rock type. In addition, a "worst case" sample of spent ore from the existing Main Beal heap leach pad was run in a humidity cell. Humidity cell test results indicate little rick of acid formation for any of the waste rock samples.

We disagree with the use of an NP/AP ration of 3 as a "trigger point" to indicate risk of acid generation. BMMI feels that the use of an NP/AP ratio of 3:1 as a "trigger point" is overly conservative for the Beal material which is clastically hosted ore deposit with generally low NP values. A summary of extensive humidity cell data is enclosed which indicates that no samples with an ABA > (NP/AP>1) were found to generate acid out of over 70 samples from various mines tested to date. The purpose of humidity cell testing is to establish a site-specific trigger point indicating ARD risk rather than relying on interpretation of static test results alone.

Table 1 - South Beal Rock Types and Percentages

Rock Type	Description	Tonnage	Percent	% Sulfide/% Non-Sulfide (Volume-Not Content)
Quartzite	Waste	1,189,000	92.24	<1/99
Marble	Waste	90,000	6.98	<1/99
Diorite	Waste	10,000	.78	<1/99
	Total Waste	1,289,000	100.00	
Quartzite (CaSi rich)	Ore w/mixing of marble Total	 2,248,840	959,840	100.00 *<25/75

* <25% of the deposit has an average sulfides content of 1-3% (non-oxidized). Of this volume, partial oxidation has occurred.

South Beal ABA/Volume

Rock Type	Description	Tonnage %	ABA Average
Quartzite/FeOx	Waste	92.24	+7
Marble	Waste	6.98	+101.3
Diorite	Waste	.78	NI
Quartzite	Ore	100	+5.4

1-23. It appears that the agencies have used the results of ABA testing from all waste and ore sampling in calculating an exceedence of the 15% level. BMMI disagrees with the approach of lumping waste and ore samples together, since waste and ore samples will be treated differently after mining. A review of the data in Appendix A indicates that only one waste rock sample had a negative ABA value, and that the remainder of the negative ABA values were from ore material, which will report to the lined heap leach facility.

As indicated in the response to comment 9, BMMI feels that the use of the NP/AP ratio as a trigger point for the Beal deposit is overly conservative. Use of the ratio seems more appropriate for carbonate-hosted ore-bodies that ocntain appreciable amounts of both carbonate and massive sulfide. However, for the Beal quartzite and FeOx materials, the balance of pyrite S and neutralization reflected in the ABA value appears to be a more reliable predictor of drainage chemistry. Humidity cell results indicate that the sulfides detected in the sulfur fractionation may not be highly reactive, possiblly due to their being encapsulated in a silicified matrix. Hence, even ABA values modestly below 0 (0 to -10) do not appear to present a risk of ARB at Beal.

1-24. The report entitled Geochemical Behavior of Sulfate: Potential Source Identification at the Beal Mountain Mine describes actions taken in response to the sulfate increases including intercepting shallow ground water from the north heap area and using this water in the processing circuit, adding additional ground water monitoring wells to further evaluate this problem, and collecting spring 5 and spring 3 for use as process water. We are pleased to see that actions have been taken in response to monitoring results. We believe, however, that these actions and other potential mitigative or corrective actions (e.g., placing an impermeable liner or compacted clay layer over the waste rock and heap embankment to further reduce infiltration of water; and using crushed limestone to line reaches of German Gulch downgradient of the pit, waste rock dump, and heap leach pad as added precaution to neutralize acid mine drainage that may find its way into the Creek; etc.) and the alert levels which trigger the contingency actions should be incorporated into the contingency plan and mine permits.

1-25. We agree in general with the contingency measures outlined by EPA if elevated sulfates are found to indicate incipient ARD in the Main Beal waste rock dump. If, however, sulfates are from other sources including soluble sulfates, then the contingencies outlined may be unwarrented. At the conclusion of the on-going program of sulfate source identification, contingency measures warranted will be outlined in a submittal to the MDSL under the operating permit.

1-26. Agencies agree. Refer to response 1-8.

1-27. Water quality protection is currently achieved through application of Montana Water Quality Standards. The DEIS contains provisions to prevent and remedy water quality violations, see Stipulations 1-8, Chapter II, and Stipulation 11 in the FEIS.However, refer to page 478 of Monanor FEIS-that plan should be adapted for BMMI. If Alternative 2 is selected, the stipulations contained therein (including contingent capping of the waste facility and heap with compacted clay and appropriate limestone amendments, if ARD develops) would become part of the mine permit. Stipulations 6 and 7 in the DEIS (p. 13) were rather general. For the FEIS, these stipulations have been enhanced.

If acid rock drainage were to develop, it would be more appropriate to line upgradient reaches of German Gulch with crushed limestone so that the alkalinity of the water would be increased. Placement of limestone downgradient of an acidic source would result in coating of the limestone with an iron oxide crust and subsequent decrease in neutralizing capacity of the limestone.

1-28. The agencies believe that the Stipulations to the Permit comprise a corrective action as requested, timely reporting of water quality data and trend analysis (see Stipulation 2, DEIS) will trigger measures to insure that water quality standards are met. Precedents exist at Beal. For example, when exceedances of water quality standards were discovered at Springs 5, 12 and 12A, effluent was diverted to process waters.

1-29. The existing Operational Monitoring Plan (pages 2-38 and 2-68, Application for a hard rock operating permit, Beal Mountain Project, Silver Bow County, Montana; submitted February 16, 1988; hereafter called O. P. 000135), requires increased frequency of monitoring if any cyanide is detected and immediate reporting of any changes of water quality. The updated Operational Monitoring Plan will provide for increased frequency of monitoring if trend analyses for metals or other parameters indicate that increased frequency is appropriate. These trend analyses will be facilitated by stipulation 2 (DEIS, p.11) which requires that monitoring data be entered into the STORET database.

1-30. The agencies disagree. The South Beal Amendment provides for two additional monitoring wells downgradient from the South Beal pits. Main Beal's groundwater monitoring network has proved effective in detecting groundwater parameter changes. As provided on p. 2-60 of O.P. 000135, "The parameter lists and sampling schedule will be reviewed and may be revised by BMMI and the DSL on an annual basis."

1-31. Pump-back of degraded spring has been initiated where appropriate. This is currently occurring at Springs 3, 5, 12 and 12A on the basis of elevated TDS.

1-32. Such changes will be initiated if necessary under the authority described in Montana Code Annotated, title 82-4-327 (3) (c). Also, see response 1-2.

1-33. A surface water interception and treatment plan is included in O.P. 000125. See pages 2-37-a and 2-38. Interception of degraded spring water has already commenced, and should prevent degradation of other surface waters.

1-34. The development of a selective ore processing/handling program is provided for in the South Beal Amendment, Volume 2, Appendix F, p.2.

1-35. Permit and bond amendments are covered in Title 82-4-337(3)(c), MCA.

1-36. Pursuant to various state and federal statues, operations may be suspended, provided such operations fail to meet specific performance or enforcement standards.

1-37. Although EPA is concerned about future expansion of this operation, only one expansion is being proposed at this time. The affects as they relate to existing problems are described under cumulative effects in Chapter IV. When and if such future exploration plans are proposed, they will be evaluated through the MEPA/NEPA permit review process. It is likely that additional future drilling would have measureable cumulative effects with the proposed and existing operations. Although some sediment may result from drill roads, Best Management Practices would be required to assure that effects on German Gulch are negligeble.

To fully address this concern is substantially beyond the scope of this EIS. As amendments to the permit application are sought, the agencies will determine the level of environmental documentation necessary based on the size, scope and potential for impact of the proposed amendment.The balance of the comment is noted.

1-38. See responses 1-28 through 1-36.

1-39. The agencies agree with the goal of no net loss of wetlands. The DEIS was incorrect. Referenced wet areas were associated with a previously permitted haul road downslope from the South Beal pits.

Montana Department of Fish, Wildlife & Parks

March 9, 1993

Alicia Stickney
Department of State Lands
Capital Station
Helena, MT 59620

RECEIVED
MAR 11 1993
STATE LANDS

Dear Ms. Stickney:

I appreciate receiving draft copies of the South Beal EIS sections pertaining to hydrology, water quality, and aquatic biology. Although several of our concerns appear to be addressed in Alternative 2, there are a few items that remain unclear:

1) The type of biological monitoring, including the frequency and duration of sampling, was not outlined. Our Department would like to review this monitoring plan when it is developed, and as I mentioned previously, we are willing to participate in additional monitoring of the cutthroat fishery. **2-1**

2) If pH drops, you give potential remedial actions such as liming or capping to address this situation. How effective are these measures, and how much maintenance is required over the long term? **2-2**

3) The document states that post-reclamation monitoring would verify that long term impacts to water quality would not occur. Is BMMI responsible for correcting future problems that might arise with water quality? **2-3**

4) Are there other means to reduce sulfate contributions originating from Spring 5 besides diverting flow? **2-4**

5) Several metals were detected in ground water samples from drill holes near the proposed South Beal pit. Could you elaborate on the potential for these metals to contaminate surface waters of German Gulch? In addition, the EIS states that Al, Zn and Cu do not have ground water standards. Despite this, I think it is important to point out that these metals are extremely toxic to aquatic life should they reach surface waters. **2-5** **2-6**

Please call me if you have questions regarding these comments.

Sincerely,

Ron Spoon
Fisheries Biologist

2. Montana Department of Fish, Wildlife and Parks; March 11, 1993

2-1. See response to comment 1-2. Aquatic biological monitoring will be a part of Beal's monitoring plan. Stipulation 5 in Chapter 2, Alternative 2 describes the type of biological sampling which is proposed by the agencies. Aquatic macroinvertebrate and periphyton sampling will be conducted seasonally according to techniques described in the references cited in this section. Aquatic macroinvertebrate communities are useful as indicators of metals and sediment pollution and periphyton communities are particularly useful to monitor nutrient impacts, as well as, metals and sediment.

2-2. Liming of waste rock will offer added buffering capacity to the system operationally, thereby neutralizing seepage. For long-term mitigation, capping has been shown to significantly reduce infiltration and oxygen diffusion into the interior of the waste dump, thereby decreasing potential seepage and reducing the rate of oxygenation (Harries and Ritchie, 1986). Tentative locations for sampling have been identified and are discussed in the text.

2-3. Yes. BMMI's bond will not be released until protection of water quality is assured. See Title 82-4-338(2),(3)and (4) MCA.

2-4. Yes, there are other means to reduce sulfate; however, the most effective means would entail the evaporation of all the flow originating from Spring 5 and other methods are not practical during active mine operations.

2-5. Presently, monitoring wells SBMW-2 and -3 characterize ambient water quality in an undisturbed area. The metals levels detected at these sites are typical of mineralized areas. Interchange between the groundwater and surface water components of German Gulch should not be altered by the South Beal project.

2-6. This comment has been added to the Final EIS.

Montana Department
of
Fish, Wildlife & Parks

1420 East Sixth Ave.
P.O. Box 200701
Helena, MT 59620-0701
May 10, 1993

Mr. Mike DaSilva
Montana Department of State Lands
P.O. Box 201601
Helena MT 59620-1601

RECEIVED
MAY 10 1993
STATE LANDS

Dear Mr. DaSilva:

Department staff have reviewed the draft EIS for the south Beal Project expansion and have the following comments.

We had not previously learned of the significant changes in water quality that have already occurred in German Gulch. Page X of the EIS indicates that considerable changes have occurred in TDS sulfates and nitrates. As you are well aware, the increase in sulfates may be due to the oxidation of sulfides and could well be the initial stages of an acid mine drainage problem. We are deeply concerned about this in view of the fact that German Gulch supports a significant population of westslope cutthroat trout. 3-1

Our staff has discussed the changes in water quality that have occurred in German Gulch with staff of the Water Quality Bureau, Department of Health and Environmental Sciences and were informed that these changes constitute a violation of the Water Quality Act. In view of the above and the importance of the fishery in German Gulch, we cannot support any expansion of the Beal Mine until the existing problems are corrected. 3-2

In our view, the scope of the changes that may have already occurred have not been adequately evaluated. We therefore request that the company initiate a comprehensive monitoring program to evaluate impacts of the changes in water quality that have already occurred on fish populations in German Gulch. We also recommend repeating all other aspects of the biological monitoring that were conducted prior to initiation of mining to evaluate whether other portions of the aquatic ecosystem have been impacted. 3-3 3-4

We view this as potentially a very serious problem.

Sincerely,

Jim Gallagher

3) Montana Department of Fish, Wildlife and Parks: May 10, 1993

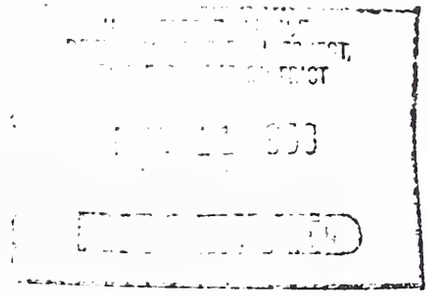
3.1. See responses 1-1, 1-2, 1-3, 1-13, 1-15, and 1-16.

3.2. BMMI has been notified of apparent water quality violations by the Department of Health and Environmental Sciences. These problems are a result of the current operation and are not evaluated in the EIS.

3.3. The Agencies feel that BMMI's monitoring plan indicates that fisheries have not been adversely affected.

3-4. Agencies would support any added documentation of fisheries, embeddedness or aquatic invertebrates.

PEGASUS GOLD
CORPORATION



May 10, 1993

Sandra J. Olsen
Chief, Hard Rock Bureau
Department of State Lands
1625 Eleventh Avenue
Helena, MT 59620

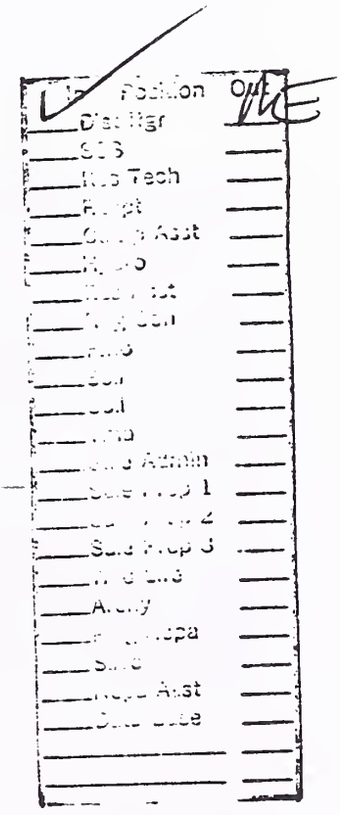
Re: South Beal Project
Draft Environmental Impact Statement

Dear Ms. Olsen:

Attached please find comments prepared by the staff of Beal Mountain Mining, Inc. concerning the South Beal Project Draft EIS.

Very truly yours,

John S. Fitzpatrick
Director, Community and
Governmental Affairs



900 North Montana • Suite 4A • Helena, Montana 59601 • Phone (406) 449-0666 • Fax (406) 449-3000

CHAPTER I - THE EIS AND PERMITTING PROCESS FOR THE SOUTH BEAL PROJECT

1) DEIS Statement, page x and page 18: THE AFFECTED ENVIRONMENT and CHAPTER III EXISTING ENVIRONMENT, Geology and Engineering: "In the highwall of the existing pit is a northwest trending fault, the Gully fault or shear zone which extends below the southwest corner of the leach pad. ... Another important geologic feature is an unnamed bedding plane which dips to the south." 4-1

RESPONSE: The Gully fault is a normal fault and extends southwest below the southwest corner of the leach pad. ... The bedding plane dips to the northeast.

2) DEIS Statement, page xii, and page 40: CONSEQUENCES OF THE PROPOSED PROJECT AND ALTERNATIVES, Ground Water Quality and CHAPTER IV CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES, Alternative 1 The South Beal Project, Ground Water: "Reclamation and revegetation would reduce infiltration by increasing runoff and evapotranspiration." 4-2

RESPONSE: Revegetation will certainly increase evapotranspiration; however, revegetation usually increases infiltration for use by plants and decreases runoff, unless the sites are capped with some impermeable material. Capping is referenced in the discussion of the reclamation plan (page 11), but only as a possible mitigation measure for sites where acid is produced.

3) DEIS Statement, Page 1:Purpose of and Need for Action, The Proposed Action: " The current mine production is about double that originally estimated ..." 4-3

RESPONSE: The reference to the issue of current mining production is not relevant.

4) DEIS Statement, Page 1: Purpose of and Need for Action, The Proposed Action: "The current reclamation bond total is set at $2,771,171. The bond amount would be adjusted to account for reclamation of the South Beal pits including backfilling, as well as reduced main haul road disturbance, if this proposed amendment is approved. The reclamation bond is projected to increase by $400,000 to $500,000 for the proposed disturbances." 4-4

RESPONSE: Discussion of the current bond levels and the anticipated bond increases is not relevant.

5) DEIS Statement, Page 1, Purpose of and Need for Action, Background: "The Environmental Assessment concluded that the Beal Mountain Mine would have no significant long- or short-term impacts on the German Gulch drainage." 4-5

RESPONSE: The EA written for the original Beal Mountain Mining operating permit discussed impacts of the proposed project well outside the confines of the German Gulch drainage.

6) DEIS Statement, Page viii (SUMMARY) and Pages 5 - 6: "The index of measure ..."

4-6

RESPONSE: Some of the "indexes of measure" that are discussed appear to be observational (pit walls and edges for movement, movement of monuments and visual observations of highwall and leach pad areas) while others are predictive (static and kinetic test results). The results of operational monitoring of the spent ore is a more appropriate "index of measure"?

7) DEIS Statement, Page viii (SUMMARY) and Page 5 - Issue and Concerns Raised in Scoping, Geology and Engineering: "What is the potential for the mine material to produce contaminated leachates? The index of measure will be pH and static and kinetic test results."

4-7

RESPONSE: Static and kinetic tests indicate that 66% of the spent ore samples showed little or no potential to form acid.

8) DEIS Statement, page ix (SUMMARY) and Page 5 - Issue and Concerns Raised in Scoping, Ground and Surface Water: "In cases where numerical criteria are not available, such as nutrients and sediment, impacts to beneficial uses are assessed through monitoring of instream biological (plant and invertebrate) communities."

4-8

RESPONSE: Maximum Contaminate levels (MCL's) are available for nitrate. Numerical criteria based on chronic and acute toxicity potential to aquatic organisms are also available for several nutrients (nitrate, ammonia, phosphorous). These criteria and standards are delineated in the EPA Goldbook.

9) DEIS Statement, Page ix (SUMMARY) and Page 6 - Issue and Concerns Raised in Scoping, Fish: "The indices of measure will be flow rate, turbidity, and concentrations of TSS, nitrates, sulfates, arsenic and copper."

4-9

RESPONSE: The use of these metrics must reference the baseline condition that BMMI lies in an area that has undergone mineralization and that the German Gulch system has been disturbed historically.

It appears clear that no viable, self-sustaining fish population is present within the mine site. Without a systematic baseline description of population numbers, habitat, and seasonal distribution of the German Gulch fishery, it is unwarranted to use these parameters as indices of measure.

CHAPTER II - SUMMARY OF PROPOSED ACTION, ALTERNATIVES AND REASONABLY FORESEEABLE ACTIVITIES

10) DEIS Statement, Page 10, Alternative 1, Operational Monitoring: "All stations would be sampled ten times annually for indicator parameters or three times a year for extended analysis." 4-10

RESPONSE: The currently approved monitoring plan calls for the collection of 10 samples per year at each station. Seven of those samples are analyzed for the indicator parameters and three samples are analyzed for the extended parameter list.

11) DEIS Statement, page 10: Alternative 1, Operational Monitoring: "These wells have been monitored since the summer of 1992 (See Figure 3)." 4-11

RESPONSE: South Beal wells are not on this figure.

12) DEIS Statement, Page 11, Alternative 2, Ground and Surface Water, Subsection 1: "BMMI would sample pit sump water monthly for extended analysis parameters." 4-12

RESPONSE: BMMI proposes to use pit sump water for process water makeup unless excess water cannot be used in the process circuit. Rather than monthly monitoring of pit water, it would appear more reasonable to require monitoring for extended parameters prior to water use for dust suppression or land application.

13) DEIS Statement, Page 11, Alternative 2 , Ground and Surface Water, Subsection 2: "BMMI would submit water quality monitoring reports from the South Beal upgradient and downgradient monitoring wells and surface water stations 3, 3a, and 4, and Spring 5, to the DSL and USFS monthly during the mining of South Beal." 4-13

RESPONSE: Unless the pit is filled with water, the use of monthly groundwater sample collection, and data submission to the agencies is unwarranted.

14) DEIS Statement, Page 11, Alternative 2 , Ground and Surface Water, Subsection 2: "The reports would be submitted in hard copy and in electronic format compatible with the STORET database, in order to facilitate independent analysis of the data." 4-14

RESPONSE: Sample databases have been submitted to the agencies, and BMMI has been informed that a LOTUS 1-2-3 format is acceptable. BMMI has altered the existing water chemistry database to allow for submission of data in the LOTUS 1-2-3 format.

15) DEIS Statement, Page 12, Alternative 2 , Ground and Surface Water Subsection 3: "BMMI would be required to implement all BMPs in the storm water permit." 4-15

RESPONSE: BMMI has agreed, through both the stormwater application process and within the MMRA application process to implement BMPs. BMMI intends to comply with all stipulations outlined in the stormwater application permit regardless of the EIS alternative selected.

16) DEIS Statement, Page 12, Alternative 2 , Ground and Surface Water Subsection 3a: "BMMI would adjust fertilizer and mulch application practices to minimize nitrate and sulfate concentrations in runoff from reclaimed areas." 4-16

RESPONSE: In both the original permit application and through the amendment application responses and additional materials submitted to the agencies, BMMI has outlined the steps that will be used to control the potential release of sulfates and/or nitrates.

17) DEIS Statement, Page 12, Alternative 2, Ground and Surface Water, Subsection 3b: "BMMI would handle ANFO to minimize nitrate release by having a redundant blast detonation system, by monitoring blasts to ensure minimal amounts of explosives are used, and by preventing, reporting and cleaning up ANFO spillage." 4-17

RESPONSE: BMMI presently uses a redundant initiation system for blasting. The amount of explosives used by Beal is totally specific to each blast and varies with wet and dry holes as well as other conditions. Due to the cost, it is common practice for BMMI to use the least amount of explosives to get the desired job done. After loading each blast pattern any spilled ANFO is picked up and added to a hole that is blasted as a part of the operation. No recording or inspection of the blast is necessary.

18) DEIS Statement, Page 12, Alternative 2, Ground and Surface Water, Subsection 3d: "BMMI would implement sediment control structures prior to ground disturbance." 4-18

RESPONSE: BMMI has committed, and continues to commit to the minimization of offsite sediment impacts.

19) DEIS Statement, page 13: Alternative 2, Ground and Surface Water, Subsection 6: "BMMI would stockpile South Beal neutral waste and use it for capping the waste rock dump and possibly the heap leach pad ..." 4-19

RESPONSE: "BMMI would stockpile South Beal neutral waste and use it 'if appropriate' for capping the waste rock dump and possibly the heap leach pad ..."

20) DEIS Statement, Page 13, Alternative 2, Ground and Surface Water, Subsection 6: "BMMI would monitor the interior of the waste dump to help distinguish potential sources for the existing sulfate concentrations." 4-20

RESPONSE: BMMI suggests that the dump effluent should be the point of concern.

21) DEIS Statement, Page 13, Alternative 2, Ground and Surface Water, Subsection 8: "BMMI would consult with the agencies including Montana Department of Fish, Wildlife and Parks (MDFWP) Fisheries Biologist, prior to further diversions of water from Springs 5 and 3." 4-21

RESPONSE: BMMI currently holds a valid water right for water from springs 5 and 3.

22) DEIS Statement, Page 13: Discussion of Alternatives and Cumulative Impacts

4-22

RESPONSE: No mention of potential timber harvests in the area are included in this section. Since the "affected environment" for wildlife seems to be pretty expansive (based on the "Existing Environment" discussion), one has to assume that logging a relatively long distance away may directly or indirectly affect wildlife in the German Gulch area. Does the USFS plan any timber harvests, especially in areas that might impact wildlife migration/nearby habitat, etc.

23) DEIS Statement, Pages 18 and 19, Hydrology, Surface Water: "This increase is related to activities in the main Beal pit and the waste rock pile." 4-23

RESPONSE: According to the Hydrometrics annual summary the low flows in 1992 may account for nearly all of the reported increases.

24) DEIS Statement, Pages 19 and 21, Water Quality, Nitrate Concentrations in Ground and Surface Water: "Nitrate concentrations have increased downgradient of the waste rock dump, downgradient from the leach pad on the north side, downgradient from the leach pad on the south side, and in German Gulch Creek." 4-24

RESPONSE: Nitrate levels at all stations and wells within the project area have steadily increased since the start of mining. While "elevated" nitrate levels do appear to be present in several of the area wells and springs, a steady increase in these values has not been noted.

25) DEIS Statement, Page 21, Aquatic Biology: "Relative to the 1984 samples, chlorophyll concentrations in recent samples appear to have increased." 4-25

RESPONSE: It does not appear that this table supports the assertions in the text. Mean chlorophyll levels in July 1992 at station 2 are lower than the mean chlorophyll levels recorded in 1984.

26) DEIS Statement, Page 21, Aquatic Biology: " Standing crop measurements at the upper site should be lower than the downstream site since headwater streams are generally less productive and growth is limited by temperature (growing season), light, gradient and other factors." 4-26

RESPONSE: The theory that standing crop measurements should increase downstream is refuted by the 1984 data, which shows decreases in standing crop measurements downstream. While this trend is undoubtedly true in large drainage basins, BMMI suggests that it apparently has little relevancy over the German Gulch system, with a drainage length on the order of 5 miles. There is some data to indicate that 1992 may represent a low water year. This could easily have more to do with the algal conditions than the presence of excess nitrogen species.

27) DEIS Statement, Page 22, Aquatic Biology: "Currently, no numeric criteria exist addressing algal growth, however, Montana Water Quality Standards prohibit the growth of undesirable aquatic life (ARM 16.20.633(1)(e))." 4-27

RESPONSE: Pegasus Gold Corporation strongly objects to the use of a criteria for which no numerical standard has been determined. This results in decisions being based on opinion rather than scientifically defensible fact.

28) DEIS Statement, Page 22, Aquatic Biology: "Diatom diversity declined from 4.22 in 1984 to 3.63 in 1992 at Site 2A on German Gulch .... Diatom diversity in ecologically similar streams ranged from 2.48 to 4.50 with a mean of 3.61 ..." 4-28

RESPONSE: It appears from this discussion that conditions at site 2A are finally approaching the expected mean value. Given the fact that German Gulch was placer mined in the past, it would appear that the diatom diversity would reflect that historic activity.

29) DEIS Statement, page 22: Wildlife, Biodiversity: "This section examines the current status of biological diversity in the Beal Mountain Mine area." 4-29

RESPONSE: Introduction of the concept of biodiversity has no relevance in this document because it has no general consensus for meaning or use.

30) DEIS Statement, page 23: Wildlife, Biodiversity, German Gulch Landscape Patterns: "The current level of human disturbance in the area of the proposed South Beal pits has already affected the capacity of the hillside to support wildlife. Currently, the site is crisscrossed with exploration roads and numerous test hole locations. Heavy equipment is routinely found working over the area." 4-30

RESPONSE: While there is little question big game animals avoid specific areas where large equipment is operating, the observational sightings of wildlife in the mine area since development of the mine indicate they quickly become habituated to man's activities. There is evidence to suggest that, since firearms are prohibited on mine property, the permit boundary itself provides sanctuary during hunting season, after which many animals remain in the vicinity of the mine.

31) DEIS Statement, page 24: Wildlife, Biodiversity, Riparian Areas and Associated Species Including MIS: "The DNF selected Management Indicator Species (MIS) for riparian areas are listed in the Forest Plan (1987)." 4-31

RESPONSE: MIS were defined by the Forest Plan in 1987, but were never mentioned in subsequent discussions with Forest biologists when South Beal material was being prepared. We were under the impression the Forest Service was moving away from the use of MIS. The reasons for this are: 1) there are very few species that are so habitat-specific that they can actually be considered to be reliable monitors of change. Thus an MIS essentially has to be

habitat-specific, because if it can thrive in more than one habitat it may not reflect the effects of management activities. For example, the hairy woodpecker was identified by the DNF Forest Plan as an MIS for lodgepole pine, but, as revealed on page 29 of the DEIS, it can be found in every forest habitat that occurs in the Beal project vicinity.

32) DEIS Statements, pages 29 and 45: CHAPTER III EXISTING ENVIRONMENT, Wildlife, Specific Species of Interest, Elk and CHAPTER IV CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES, Wildlife, All Alternatives, Specific Species of Interest, Elk: "Since the mine operation began, calving has shifted away from the mine site. ... The loss of these sites may have impact on species with low mobility but will have little effect on species that are able to leave the area." 4-32

RESPONSE: Pegasus Gold Corporation requests the evidence which this statement was based on. To our knowledge, there have been no subsequent systematic investigations of the wildlife in the vicinity of the mine subsequent to the work done in preparation for the submittal of the original Beal Operating Permit application. If such additional information exists, we would like to add it to our literature file, and request a citation for it. The statement which occurs on page 45 seems to contradict the reference to impact on the elk herd from the operation.

33) DEIS Statement, page 32: Resources with No Significant Impacts; Soil Resources: "The soil pH values are naturally occurring because of the vegetation community on the site and not related to the presence of the ore body in the area." 4-33

RESPONSE: This isn't entirely accurate. The low pH values are caused by humic acid in the organic layer of the soil, as a result of the climate at high elevations which does not allow sufficient decomposition. At lower elevations, soils in the same vegetation community will not have such a low pH.

34) DEIS Statement, Page 33, Resources with No Significant Impacts; Cultural Resources: "Extensive cultural resource inventory of German Gulch and the proposed project area began in 1981 when BMMI began mineral exploration and contracted Mineral Research Center of Butte, Montana to conduct cultural resource investigations ..." 4-34

RESPONSE: BMMI did not exist in 1981. This work was contracted by Montoro Gold, under a former operating permit application process.

CHAPTER IV CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

35) DEIS Statement, Page 37, Geology and Engineering, Main Beal Spent Ore: "Kinetic test were not done on fresh ore from the South Beal deposit because the ore would be limed in the agglomeration process, prior to cyanidation and results could be inconclusive." 4-35

RESPONSE: If the humidity test for South Beal ore would be inconclusive due to lime addition, the static tests should represent a "worst case". The agencies should indicate how the amount of lime used in the agglomeration circuit relates to the APP requirement.

36) DEIS Statement, Page 37, Geology and Engineering, Main Beal Spent Ore: "The leachates were not analyzed for metals at the end of testing. Therefore, testing results were inconclusive regarding the potential for arsenic mobility." 4-36

RESPONSE: The protocol used to conduct the humidity cell tests was submitted and agreed to by the agencies. Under this protocol, the tests were to be run for 10 weeks. BMMI elected to continue two of the tests for 15 weeks. BMMI has taken a great deal of time and expense to provide the agencies with opportunities to comment on the proposed test methodologies, and to meet with the agencies and discuss the preliminary results of the analysis. At no time did the agencies indicate a problem with the test methodology or the results.

The proposed sampling frequency and sample numbers were also presented and discussed with the agencies. Based on the proposed index of measure, it appears that the dominant testing done to date indicates that waste and ore from both the main and South Beal deposits will not sustain a long-term release of acid or metals.

As part of this permit amendment, BMMI has submitted a geochemical characterization plan, which the agencies have reviewed and accepted. If the initial results of the geochemical studies are incorrect and there is a potential for sustained long-term release of acid or metals from the heap, it should be identified under that program. Since the heap is a lined facility with a zero-discharge design, BMMI feels, if the geochemical studies indicate a potential problem, alternative reclamation and capping designs can be developed in accordance with the contingency plan.

37) DEIS Statement, Page 38, Direct and Indirect Effects, Engineering, Main Beal: "The heap stability analysis and design was done to allow for increased loading up to a total height of 75 feet, and total mass of 11 million tons."

RESPONSE: The geotechnical stability analyses of the heap have indicated that the heap will be stable at ore depths greater than 75 feet and at design volumes of more than 11 millions tons. The proposed ore depth and volume are not the ultimate design limit. 4-37

38) DEIS Statement, Page 42, Alternative 2 Ground and Surface Water Direct and Indirect Effects: "Increased frequency of data submittal, discussed in Alternative 2 in Chapter 2, during the mining of the South Beal deposit would allow the agencies to review monitoring reports while mining is ongoing." 4-38

RESPONSE: To date, there has been no discussion that the current frequency of data submittal has caused any lack of timely data review by the agencies. BMMI has agreed to submit data under a electronic format that is acceptable to the agencies on a quarterly basis. The additional submittal of data on a monthly basis is not warranted.

39) DEIS Statement, Page 42, Alternative 2, Ground and Surface Water, Direct and Indirect Effects: "Sulfate concentrations would be the same as discussed in Alternative 1." 4-39

RESPONSE: In Chapter 2 of the DEIS, alternative 2 (page 12) , mitigation #3a indicates that changes in the fertilizer rates and types would reduce sulfate releases. This is in conflict with the rest of this section, which suggests that sulfate concentrations would be unchanged by adoption of this alternative.

40) DEIS Statement, Page 42, Alternative 2, Ground and Surface Water, Direct and Indirect Effects: "Biological monitoring stipulated by the agencies and discussed in more detail in Chapter 2, would help assessment of the current conditions and detect any impacts from the proposed expansion not effectively monitored by the current chemical monitoring program alone." 4-40

RESPONSE: The water resources monitoring plan used by BMMI has undergone numerous revisions and continuous review by the agencies. This plan, as approved by the agencies, does not include a biological component for a variety of reasons, including the applicability of biological indicators to the German Gulch system. To date, the use of a water chemistry plan appears to have done a good job of detecting changes in surface and groundwater chemistry conditions in the area. It is unclear what additional benefit the inclusion of a biological program could offer.

While biological monitoring may be applicable at some locations, the use of such a program is frequently hampered by the lack of numerical assessment of impacts and criteria to define more precisely when a perceived problem is actually a real problem. The data presented by the agencies does not appear to support the contention that German Gulch has been significantly impacted by BMMI activities.

41) DEIS Statement, Page 42, Alternative 2, Ground and Surface Water, Direct and Indirect Effects: "Biological monitoring would also document the effectiveness of BMMI proposed Best Management Practices (BMPs) to control nonpoint source pollution." 4-41

RESPONSE: It is not clear how the effectiveness of BMP's would be evaluated using biological information.

42) DEIS Statement, Page 43, Cumulative Hydrologic Impacts for All Alternatives, Surface Water: "Implementation of Alternative 2 mitigations should eliminate WQB violations." 4-42

RESPONSE: What WQB violations are being referred to?

43) DEIS Statement, Page 43, Cumulative Hydrologic Impacts for All Alternatives, Surface Water: "However, based on pre-mine and 1991 monitoring nitrate concentration and monthly flow, the nitrate load from German Gulch has increased from 24.4 to 1,116.6 pounds per year." 4-43

RESPONSE: The nitrate increase is partially the result of reduced flow rates.

44) DEIS Statement, Page 44, Wildlife, Biodiversity: "Table 4.1 Past, Present, and Foreseeable Actions in the Beal's Hill Area" 4-44

RESPONSE: This table does not represent an accurate description of activities in the Beal's Hill area. Please refer to the corrected table below:

Table 4.1 Past, Present, and Foreseeable Actions in the Beal's Hill Area

ACTION	LOCATION	ACRES (APPROX)	YEAR	METHOD
Beal Mtn Mine	German Gulch	425	1988	Open Pit/Roads Heap Leach
Mining Exploration	German Gulch	5	89/90	Road Building
Mining Exploration	German Gulch	10	91/92	Road Building
South Beal Expansion	German Gulch	25	1993	Open Pit/Roads
Mining Exploration	German Gulch	3	1993	Road Bldg-Proposed
Mining Exploration	American Gulch	2.5	1993	Road Bldg-Proposed
Beal Extension	German Gulch	0	1994?	Deepening of Pit
TOTAL		470.5		

45) DEIS Statements, pages 50-51: Fisheries: Discussion of fisheries.

RESPONSE: It is difficult to differentiate between the BMP's proposed for Alternative 1 and Alternative 2. In addition, the second section (Alternative 2) does not discuss the biological monitoring program, which was implied as a modification in section 4, "Cumulative Fisheries Impacts for All Action Alternatives." 4-45

The DEIS statement that: **"Existing levels are not expected to adversely affect fish populations in German Gulch. However, there has been some impairment of the periphyton community at Station 3A. Additional increases in these parameters may further affect the aquatic periphyton communities and aquatic microinvertebrate populations, which, over time, may adversely affect fish populations in the upper reaches of German Gulch."**

RESPONSE: The conclusion that there has been some impairment of the periphyton community is not suppoprted by data. The changes in the aquatic periphyton and macroinvertebrate communities may benefit fish, rather than adversely affect them.

The DEIS Statement that: **"Additional diversion of flows from Springs 3 and 5, if necessitated by water quality concerns, may reduce winter habitat capability upstream of Station 2A."**

RESPONSE: BMMI holds water rights for Springs 3 and 5.

4) Peagus Gold Corporation; May 10, 1993

4-1. and 4-2. Corrections noted. The Final EIS has been edited to include this information.

4-3. Comment noted. The increased production rate was not analyzed in the 1988 EA.

4-4. Due to public concern regarding final reclamation a discussion of the bonding increases was included to provide a basis for discussion during the comment period. Also, the estimated bond increase is included to give the concerned public a perspective of the proposed disturbance and associated reclamation cost as compared to the existing disturbance and associated reclamation costs. In addition to the South Beal bonding requirements, a portion of the total revised bond will have to cover contingencies in the event ARD becomes a problem. The contingency bond amount will cover the cost of removing soil from the 2:1 waste facility and heap slopes, reducing the waste facility and heap slopes from 2:1 to 3:1, hauling and placing a clay cap on the waste facility and heap and replacing soil and revegetation the waste facility and heap surfaces. The contingency portion is not included in estimated bond increases given in the Draft EIS.

4-5. Corrections noted. The Final EIS has been edited to include this information.

4-6. Comment noted. Indices of measures are being redefined. The index of measure for the slump movement is feet per day. The movement is monitored daily and recorded on a continuous graph. If the slope of the line on the graph changes it is an indication that the slump movement is increasing, and remediation action would be taken.

4-7. Comment noted. Indices of measures are being redefined.

4-8. The commenter has misinterpreted water quality standards. The Montana Water Quality Act protects uses of water, including fish and aquatic organism. The criteria cited in the comment are not protective of these uses.

4-9. Comments noted. The Final EIS will be revised to include BMMI's concerns.

4-10. The Draft EIS was incorrect. Corrections have been made.

4-11. Figure 3.1 is revised to include an explanation, scale, north arrow, South Beal monitoring wells, and the proposed Beal pits..

4-12. The agencies agree with BMMI's suggestion. The Final EIS is revised to include this suggestion.

4-13. Comment noted. The agencies believe that monthly submission of water monitoring reports for the referenced sites is warranted to facilitate trend analyses in a timely fashion.

4-14. The only file format(s) acceptable to the DHES are those compatible with the STORET database. The DSL may find other formats acceptable.

4-15. Comment noted. That sentence has been deleted from the Final EIS.

4-16. This stipulation was added to allow the agencies additional control over fertilization and mulch application practices.

4-17. Stipulation 3b has been revised to read "recorded" rather than "reported".

4-18. Comment noted.

4-19. Comment noted. Stipulation 6 is revised in Final EIS.

4-20. Effluent from the toe of the waste rock facility already indicated a possibility of sulfide oxidation. To help determine the source for increased sulfate in Spring 5, monitoring of the interior of the waste rock facility, using thermistor, neutron probe and suction lysimeter will supply information needed to determine what the sulfate sources are.

4-21. Comment noted. Although BMMI may hold water rights to various springs, these rights do not confer the right to discharge waste or otherwise pollute State waters.

4-22. No timber harvest are scheduled in the forseeable future.

4-23. The Final EIS is revised to include the results from the Hydrometrics summary.

4-24. This statement contradicts itself.

4-25. Mean chlorophyll concentration in German Gulch increased from an average of 16 mg/L in 1984 to 55 mg/L in 1992. Because these samples were collected at different locations, dates and without the benefit of appropriate reference or control sites, the data may be subject to varying interpretations, as acknowledged in the text. No additional information has been provided by the applicant that would support any other interpretation of the data. This information is part of the Existing Environment section (Chapter III) and is not presented as the agencies' analysis of the environmental impacts of the proposed expansion. However, the lack of information on aquatic resources from which to assess project impacts reiterated the need for operational monitoring.

4-26. Please refer to the response to 4-25.

4-27. The agencies agree. This statement only addresses the existing environment. No decisions are based on criteria for which no numerical standard has been determined. Numeric criteria are available for only a few constituents. Narrative criteria are a fundamental component of all State and federal water quality standards and were developed to protect uses for which numeric criteria are not available.

4-28. Historic placer mining in German Gulch would have minimal impacts on the existing water quality relating to the current mining operations.

4-29. The term biodiversity describes the variety of life and it's accompnaying ecological processes. It is a common term used in the scientific ommunity and the public at large.

4-30. Observations noted.

4-31. MIS is appropriately in the context of this analysist

4-32. Clarifications have been made in the Final EIS.

4-33. The Final EIS is revised to include BMMI's discussion.

4-34. The Draft EIS is incorrect. The Final EIS is revised.

4-35. The agencies disagree with using static data to extrapolate to field conditions. This statement was included merely to explain to the public why fresh South Beal ore was not suitable for use in kinetic testing, i.e. results could be inconclusive.

4-36. The protocol for kinetic testing was agreed to under the assumption that results which indicated potential for contaminant leaching would be followed up on according to standard scientific procedure. As indicated in the documents, "sulfate continued to be released for all three spent ore samples", "chemical analysis of humidity cell leachate extracted after the ninth week of testing indicated the possibility of arsenic mobility", and "the pH trend analysis for the spent ore sample of greater than 2mm indicated a substantial drop in the last 2 weeks of testing from 8.24 to 6.4". If BMMI disagrees with the conclusions rather than the protocol, additional discussion should be presented to the agencies.

4-37. Comment noted. The Final EIS is revised to include a discussion of the ultimate design limit for the heap leach pad.

4-38. The agencies do not consider annual submittal of data in April of the following year to be timely. More frequent submittal of raw data is warranted. For the South Beal project, which will last only one year, the existing plan would prevent the agencies from reviewing BMMI's water quality data until the project is completed.

4-39. The Draft EIS was incorrect, and corrections have been made to the Final EIS.

4-40. The current monitoring plan which addresses water column chemistry only is inadequate to determine compliance with Montana water quality standards and ensure that beneficial uses are fully protected. The data that has been collected indicates exceedances of water quality criteria. Because the frequency and duration of these exceedances cannot be established by the current monitoring program it is necessary to increase both the frequency of sampling (and reporting) and include biological monitoring.

4-41. Biological communities respond to both physical and chemical changes in the environment such as increased sediment load. Best Management Practices are designed to reduce the sediment load in German Gulch and therefore, biological communities should respond favorably.

4-42. Noted. Correction has been made in the Final.

4-43. Comment noted. The Final EIS is revised to include this information. The loading calculation takes flow rates into account.

4-44. This table has been corrected in the Final EIS.

4-45. The information available to the agencies on aquatic communities in German Gulch indicates that biological communities are moderately impaired. There is no evidence to suggest that increases in sediment and metals benefits any component of the aquatic community. Imbalances in nutrient concentrations, such as increases in nitrogen, may promote the growth of undesirable aquatic species such as filamentous algae which are generally less palatable and reduces the amount of available habitat for more beneficial species. Secondary impacts, such as a decrease in the concentration of dissolved oxygen below standards may also occur in extreme situations. These changes tend to have a negative impact on fish communities which depend on sustained production of aquatic macroinvertebrates.

5) Mineral Policy Center; May 11, 1993

5-1. The potential for acid drainage and other water quality impact have been analyzed by the agencies. Mitigative measures to correct existing water quality problems and prevent further problems have been developed; see Alternative 2. The referenced low concentrations of cyanide were detected in 1990; levels detected were well below any human or aquatic health risk level. Repair of a punctured pond liner has prevented any further cyanide leaks.

5-2. The agencies agree that increased sulfate concentrations may indicate incipient ARD and must be carefully investigated and monitored. A more proactive evaluation of potential sources for the sulfate releases is stipulated in the Final EIS, Stipulation 6.

5-3. The rock monitoring plan, proposed by BMMI, has not been used by ZMI. Only water monitoring was being done at the Zortman and Landusky mines; waste rock characterization was not conducted on a regular basis until 1993. The waste segregation plan now in place at Landusky is very aggressive but it has just recently been initiated. Although there are some unanswered questions regarding sulfate sources at the Beal Mountain mine, there are no significant decreases in Ph or marked increases in metals as is the case at the Zortman and Landusky mines. The agencies have come to a consensus that Stipulation 6 will suffice to help evaluate the potential source of sulfate in Spring 5.

5-4. Mitigation for potential contaminant leaching is adequately discussed in the document. See Draft EIS pp. 11-13, Stipulations 1 through 8. These stipulations would prevent acid and metals contamination problems if ARD were to develop. Buffering is not the only mitigation discussed with regard to contaminant leaching.

5-5. Mining is piecemeal by nature. The financial costs of exploratory drilling often prevent complete delineation of all ore reserves prior to initiation of mining. Knowledge gained as mining progresses may allow mining of low grade rock previously considered uneconomic. The definition of the ore reserve is controlled by the application of improved mining technologies and by precious metal price fluctuations. The scope and possible long-term consequences of the mine's proposal are being considered in the documents, as well as cumulative effects and connected actions. There is no evidence that BMMI plans major mine expansions. Geological data does not indicate that ore reserves extend beyond the boundaries of the present or proposed pits. Until the mine proposes an additional expansion, an environmental assessment is not required.

5-6. The agencies agree that the statement needs clarification. The reader should also refer to Chapter IV, page 38 of the Draft EIS. The 10 million tons of ore originally permitted does not represent the capacity of the leach pad, but rather the mass or ore reserves contained within the main Beal ore deposit above the elevation of German Gulch at the time the original permit was issued. The 10 million ton figure is related only to proposed pit size in the 1988 mining application, not to heap stability or liner integrity. The ultimate capacity analyzed at that time was 11 million tons piled 75 feet high. However, in 1992 a new stability analysis was done to look at an ultimate capacity of 16 million tons piled 120 feet high (*Design Review of Slope Stability and Water Balance Stage Three Leach Pad*, Klohn Leonoff Inc., January 27, 1992.). The report concluded that if the southwest corner of the heap was reconfigured and flattened from a slope of 2:1 to a slope of 2.5:1 that the heap and liner would remain stable. The new heap design and stability analysis concluded that 16 million tons or ore could be safely contained on the heap. The Final EIS is revised to add clarity to the discussion.

MINERAL POLICY CENTER

• P. O. BOX 369 • BOZEMAN • MONTANA • 59771 • 406-585-9009 •

7 May 1993

Mike DaSilva
Montana Department of State Lands
Capitol Station Helena, MT 59620

Dear Mike:

On behalf of the Mineral Policy Center, please accept the following comments on the draft EIS for the proposed expansion of the Beal Mountain Mine - the "South Beal Project".

On reviewing this document, we are concerned that it indicates a high potential for problems to occur, particularly in the area of water quality, that are inadequately considered in the analysis. We note with interest that the original EA under which the Beal Mountain operation was permitted in 1988 concluded there would be "no significant long-term or short-term impacts on the German Gulch Drainage", yet significant impacts are already occurring. Note for example that total dissolved solids, sulfates and nitrates in the vicinity of the mine are showing a marked increase, and "low concentrations of cyanide have been detected in several springs and monitoring wells in the area." 5-1

Increased sulfates are, as you know, a likely precursor of acid rock drainage (ARD). In light of what is occurring right now at another Pegasus operation, the Zortman-Landusky Mine, where ARD has quickly become a very serious problem, far more consideration of the cause and consequences of such indicators as sulfates is needed. The document states in fact that "The rocks associated with the South Beal deposit contain some sulfides, so there is some potential for acid rock drainage." This serious matter deserves far more extensive and meaningful analysis. And again the EIS should reference problems that are occurring at other Pegasus operations such as Zortman-Landusky and how they could be avoided with South Beal. 5-2

The document states that the proponent "has proposed a rock monitoring program that would allow the company and the agencies to predict problems with acid rock drainage ..." Please note that Pegasus was also doing much of the monitoring at the Zortman-Landusky Mine and apparently failed to recognize or chose to ignore the current problem situation until it became extremely serious. Mineral Policy Center believes that it is incumbent upon our regulatory agencies to monitor permitted mine operations. If the commitment or resources required for such monitoring are unavailable, no permit should be issued. 5-3

Mitigation for potential ARD is inadequately discussed in the document. The situation appears strikingly similar to the Richmond Hill Mine (LAC Minerals) in South Dakota, where a possibility of ARD was suggested but deemed correctable through mitigation with buffering. That small heap leach operation has now decimated portions of a trout stream through leaching acids and metals. Buffering did not work, the mine has been fined nearly a half million dollars, and long term mitigation has been estimated to be well in excess of $20 million. While hindsight is now useful for Zortman-Landusky and Richmond Hill, there is still opportunity for foresight at South Beal. It appears to be greatly needed for an analysis that is giving woefully insufficient attention to acid and metals contamination problems. Concerns for the pure strain westslope cuttroat trout in German Gulch are warranted and have been insufficiently contemplated. 5-4

The document notes that production from the Beal Mountain operation is already double original estimates and it seems apparent that the proposed expansion is just the beginning of major expansion initiatives. The scope and possible long range consequences of expanded mining at the Beal Mountain site should be considered in addition to the limited scope of this proposal. "Piecemealing" of mine developments, without a consideration of connected actions and cumulative effects, is unacceptable. 5-5

The DEIS states that Alternative 1 "would change the permitted tonnage of ore on the heap from 10 million tons to 11 million tons." No justification for this is provided. It is assumed that the 10 million ton figure was set for a reason, yet no explanation of why an additional million tons is acceptable is provided. What ramifications might this decision have in terms of heap stability and liner integrity? 5-6

The document states that if the no action alternative is selected, BMMI's commitment to address acid rock drainage from the heap would not be included." Are reviewers to conclude that such a "commitment" is contingent upon BMMI (the Pegasus operator) getting authorization to proceed with the expansion it proposes? This apparent attitude certainly doesn't help alleviate ARD concerns. 5-7

The current bonding level and its suggested increase for this proposed expansion seem very inadequate considering the potential for acid generation at the Beal Mountain site. Calculations for bonding should be included in the analysis. The document does not provide sufficient assurance that reclamation will occur as 5-8

suggested. Monitoring for reclamation is also inadequate. The document does not say how long monitoring will be maintained?

Baseline data relevant to the current operation and its proposed expansion appear to be inadequate. As the mine was permitted with an EA and relatively limited baseline data is offered, it would seem more comprehensive data on site conditions is needed. 5-9

These are some of the deficiencies Mineral Policy Center believes are inherent in this document. It should be remanded and aspects including concerns about surface and ground water quality, cumulative and connected effects, reclamation and bonding should be readdressed. 5-10

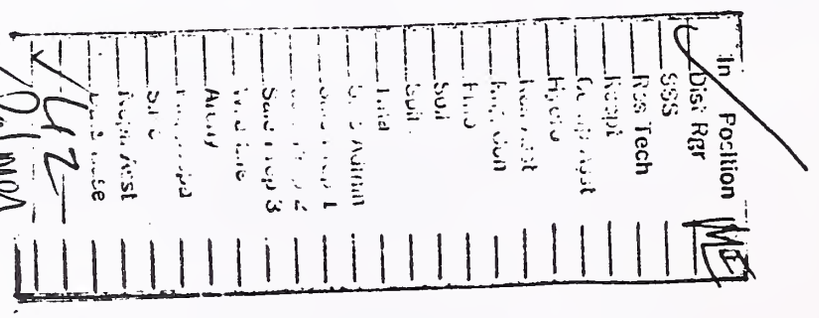
Thank you for considering our concerns. Please keep this office posted on all decisions, notices, reports, etc. issued regarding the Beal Mountain operation or its proposed expansion, as Mineral Policy Center wishes to participate fully in the MEPA and NEPA process.

Sincerely,

William Patric

William Patric

cc Margie Ewing
Deerlodge National Forest



5-7. Under title 82-4-337, MCA, the Department of State Lands has the authority to review the mine's operating permit and reclamation plan. Even if this amendment were not permitted, the Department could initiate the "337" process to redefine the mine's reclamation plan with regard to contaminant leaching.

5-8. The reclamation bond amount and calculations are not considered to be part of the analysis of the environmental impacts from the proposal and alternatives. The bond estimate is included to put the associated reclamation costs of the proposal in perspective with the reclamation costs of the existing disturbance. Bond calculations are based on the approved or amended reclamation plan. They do not include costs of something that is speculative or unknown. To date it has not been demonstrated that acidification is a definite concern and studies are ongoing. Due to the rock type and low sulfide content, any acid generation most likely would not be severe. If acid generation does occur, the Montana Metal Mine Reclamation Act allows for bond adjustment to be made (82-4-338 MCA). The bond amount, by law (82-4-338(2)), has to be reviewed every five years for adequacy.

In order to ensure that the mining company would accept responsibility for the site if an ARD problem develops, and the bond was not revised, a portion of the current revised bond amount will have to include costs for ARD contingencies. These contingency plans have not been developed, but some estimates and assumptions will be made to come up with costs associated with capping the waste facility and heap with clay. The estimated bond increase in the Draft EIS does not include the cost of these ARD contingencies. If an acid mine drainage problem does occur in the future a detailed plan to deal with it will be developed and the associated costs would be included in an additional updated bond amount. Also, the bond calculations are public information and can be reviewed at any time at the DSL Helena office.

In 1988, BMMI proposed a tentative post-operational monitoring plan (O.P. 00135, pp.3-66 to 3-68). This plan is to be revised based on results of operational monitoring, and must be approved by the DSL prior to implementation. The tentative plan called for biannual monitoring of eight monitoring wells, two springs, and three stations in upper German Gulch. The agencies have the authority to revise the monitoring plan annually as needed, and will assure that the post-reclamation monitoring plan is adequate. Monitoring would continue until the data provides assurances that no significant degradation will occur (see Draft EIS, Chapter II, pp. 11-13.). Sulfate, nitrate and TDS concentrations must return to near baseline conditions. All requirements of MMRA and of BMMI's permit must be met, and reclamation (including water quality) must be to the agencies' satisfaction for bond to be released. Also, as per 82-4-228 (3) MCA, no bond may be released until the public has been provided an opportunity for a hearing.

5-9. Baseline sampling was conducted biannually in 1987 and 1988 prior to commencement of mining at the Beal Mountain Mine. This baseline data was collected from nine surface water monitoring sites, nine springs, twenty nine monitoring wells and one adit. Fourteen metals, six anions and five cations were analyzed for. Since 1989, monitoring has continued ten times annually at these and additional monitoring wells, plus seven surface water monitoring sites and five springs. All of this monitoring represents baseline data for the South Beal proposal. The agencies consider this to be adequate baseline data. The fact that the mine was permitted under an EA does not in any way imply that baseline data is lacking.

References

Harries, J.R. and A.J.M. Ritchie, 1986. The Impact of Rehabilitation Measures On the Physicochemical Conditions Within Mine Wastes Undergoing Pyritic Oxidation, Fundamental and Applied Biohydrometallurgy. International Symposium on Biohydrometallurgy, Vancouver, Canada. August 21-24, 1985. Elsevier pp.341-351.

DEPARTMENT OF COMMERCE
LOCAL GOVERNMENT ASSISTANCE DIVISION

MARC RACICOT, GOVERNOR

1424 9TH AVENUE
PO BOX 200501

STATE OF MONTANA

(406) 444-3757

HELENA, MONTANA 59620-0501

May 10, 1993

Mike DaSilva
Hard-Rock Bureau
Montana Department of State Lands
Capitol Station
Helena, MT 59620

Re: Draft EIS for Beal Mountain Mining Company's Proposed South Beal Project

Dear Mike:

P. 4, item 4: One small clarification to your draft EIS: although some people habitually refer to the Board's role, as you have, as that of a "referee" in disputes between developers and local government units over their impact mitigation plan, the Legislature has, in fact, given the Board responsibilities and authority considerably beyond that of a "referee." In your second sentence under item 4, page 4, it would be more correct, while still succinct, to delete "...it is intended to act as a 'referee' in hearing [disputes]..." and say, instead, "...**it administers the Impact Act and adjudicates** [disputes]...." 6-1

Thank you for the opportunity to comment of the draft EIS.

Sincerely,

Carol Ferguson

Carol Ferguson
Hard-Rock Mining Impact Board
Montana Department of Commerce
Capitol Station
Helena, MT 59620
(406) 933-5396

6) State Of Montanan Department of Commerce

6-1. Response noted and correction made in the Final EIS.

8925 EAST NICHOLS AVENUE
ENGLEWOOD, CO 80112-3410
U.S.A.
TELEPHONE (303) 792-9848
FAX (303) 792-5949

LAC

LAC MINERALS LTD.

June 11, 1993

Mr. Mike DaSilva
Montana Department of State Lands
Capitol Station
1625 Eleventh Avenue
Helena, MT 59620

Dear Mr. DaSilva:

This letter is in regard to the May 7, 1993 comments the Department of State Lands received from the Mineral Policy Center on the draft EIS for the South Beal Project. On page 2 of the comments, a reference was made to the Richmond Hill Mine which was inaccurate or at best misleading.

The Richmond Hill Mine, located near Lead, South Dakota, did encounter acid rock drainage (ARD) during early 1992. An interim remediation plan was developed and implemented upon discovery of the ARD situation which minimized any adverse impacts to the environment. A long term mitigation plan is now being finalized in cooperation with the State of South Dakota.

According to the Mineral Policy Center comments, "That small heap leach operation has now decimated portions of a trout stream through leaching acid and metals." This statement is simply not true.

The Richmond Hill Mine drains into Spruce Gulch, a tributary of Squaw Creek. Spruce Gulch, prior to 1992, was historically dry and therefore never contained aquatic life. It would therefore be difficult to "decimate" a stream that previously never existed. Further, in aquatic tests conducted in Spruce Gulch and Squaw Creek, bioassay fish survived in Spruce Gulch water and in Squaw Creek below the confluence with Spruce Gulch. The number and diversity of aquatic organisms in Squaw Creek immediately below the confluence with Spruce Gulch was nearly identical to a control station established. There was clearly never any decimation of any trout stream. 7-1

The long term mitigation plan has not been finalized, however, preliminary estimates of cost are between $5 and $10 million dollars, not $20 million as indicated in the Mineral Policy Center comments. Further, these costs are not only for long term mitigation of ARD, but also include all costs for complete reclamation of the Richmond Hill Mine.

If you have any questions regarding this matter, or would like additional information on the Richmond Hill Mine, please feel free to contact me.

Sincerely,

Jerry W. Danni
Director, Environmental and Government Affairs

JWD:jlt

cc: Margie Ewing, Deerlodge National Forest
Mike Carter, Richmond Hill Mine
Carl Straub, Jr. Esq.

LAC

7) LAC Minerals LTD.

7-1. Comments noted.

LIST OF PREPARERS AND CONSULTATION

PREPARERS:

Coordination
Mike DaSilva DSL
Liz McFarland, USFS

Air Quality/Climate
Pat Driscoll, AQB/DSL

Cultural Resources
Joe Gurrieri, DSL
Richard Periman, USFS

Geology and Engineering
Rebecca Miller, DSL
Jeff Snyder, DSL
Dan Avery, USFS

Land Uses
Pat Plantenberg, DSL

Socioeconomics
Jo Stephen, DSL

Technical Editing/Writing
Palmer Bowen, USFS

Water Resources
Tom Reid, WQB/DSL
Wayne Jepson, DSL
Tim Sullivan, USFS

Wildlife and Fisheries
Brian Sanborn, USFS
Sally Sovey, USFS
Pete Strazdas, DSL

Soils/Reclamation
Pat Plantenberg, DSL
Dave Ruppert, USFS

CONSULTATION:

The following is a list of other agencies, groups or individuals who were contacted or contributed information to this EIS:

United States Environmental Protection Agency
United States Fish and Wildlife Service
Montana Department of Fish, Wildlife and Parks
State Historic Preservation Office
Montana Department of Health and Environmental Sciences Air Quality Bureau
Montana Department of Health and Environmental Sciences Water Quality Bureau

LIST OF AGENCIES, ORGANIZATIONS AND PERSONS TO WHOM COPIES OF THE FEIS HAVE BEEN SENT

List of agencies, organizations and persons to whom copies of the FEIS were sent:

Federal, State and Local Government Agencies

EQC - Debbie Schmidt
Governor's Office - Art Wittich
Fish, Wildlife & Parks - John Mundinger
State Historic Preservation Office-Marcella Sherfy
DHES Air Quality Bureau - Jeff Chaffe
DHES Water Quality Bureau - Steve Pilcher
DNRC Facility Siting Bureau - Art Compton
DNRC - Water Rights Bureau
Dept. of Commerce Building Codes - Jim Brown
Dept. of Commerce Hard Rock Impact Board
EPA - Helena Office
Montana Tech Library Document Department
Montana State Library
Department of State Lands - Greg Hallsten
Board of Health and Environmental Sciences
Butte Ranger District - District Ranger
Deerlodge National Forest - Dan Avery
Anaconda Unit Office
Southwest Land Office
Mile High Conservation District
MT Dept. Fish, Wildlife & Parks - Mike Frisina
MTDFWP - John Firebaugh
Anaconda-DL County Commissioners
Dept. of State Lands - Bob Andreozzi
Office of Federal Activities - EPA
Office of Environmental Affairs
USDA Forest Service - Washington, DC
USDA Forest Service - Missoula, MT
US EPA Montana Office
BLM - Headwaters Manager
Powell Co. Commissioners-Don Valitan

Organizations

LCM Ltd.- Amy Davis Martin
National Wildlife Federation - Tom France
Ron Burke
MEIC - Jim Jenson
NPRC - John Gayusky
Noranda Minerals Corporation - Doug Parker
Noranda Mineral Corp - Mark Petersmeyer
MT Mining Assoc. - Deerlodge Chapter
Deerlodge Conservation Coal - Sean Sheehan
Minerals Policy Center - Bozeman Office
MT Environ. Info. Center
MT Mining Assoc. - Gary Langely
MT Wildlife Federation
Fairmont Hot Springs
Headwaters RC&D
MT Wildlife Fed. - Ken Frazier
Pintler Audobon Society
Trout Unlimited - George Grant Chapter
Deerlodge Conservation Coal - S. Sheehan
Anaconda Sprotsmen Club
American Fisheries Society
Native Ecosystems Council-Sara Jane Johnson
Louisiana-Pacific - Ed Coates
Clark Fork Coalition
Anaconda Sportsmen's Club - Charlie Dowd
Deerlodge Snowmobile Club

Individuals

Yoli Fitzsimmons
Mike Skoulich
George Richman
Leslie R. Jaconen
Tom Moodry
Carol Ferguson
Dan Harrington
Fred Daily
Robert Pavlovich
Joe Quilici
Dave Brown
John Lynch
Lawrence G. Stimatz
Judy Jacobson
Edward A. Heard
Joseph S. Ivanich
Charlie O'Leary
Arthur Laranie
Thomas C. Brophy
James R. Casey
Mike Thatcher

Tom Lee
Michael Kerns
Steve Donaldson
Mike Sheehy
Dave Curry
George Ruhmms
Paul Dale
Dori and/or Michael Revay
Jerry L. Harold
Clint Frick
Tony Schoonen
Jerry Koblitz
Jean Tourikas
William Menahan
Kathy Hadley
Robert Blotkamp
William Haskins
Dan Hook
Bob Carroll

These agencies, organizations and individuals also received the FEIS. In addition, the following received the FEIS.

GLOSSARY

2:1	Slope angle measurement expressed as a ratio of horizontal distance to vertical distance; For example, the slope is twice as long horizontally as vertically; 2:1 = 27°
ABA	Acid Base Accounting
ANFO	Ammonium nitrate/fuel oil - a blasting agent
alkaline	having a pH greater than 7
ANP	Acid Neutralizing Potential
APP	Acid Producing Potential
AQB	Air Quality Bureau
BMMI	Beal Mountain Mining Incorporated
concentration	amount of material contained in a specified volume, or the strength of a solution (mass per volume)
degradation	the increase in concentration of certain regulated substances above background levels. This may only be allowed by the BHES based on necessary social and economic concerns.
DHES	Department of Health and Environmental Sciences
DNF	Deerlodge National Forest
DSL	Department of State Lands
EA	Environmental Assessment - an environmental document of a proposed action and its effects on the environment.
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
fault	a break in the continuity of a rock formation, caused by shifting of the earth's crust.
gpd	gallons per day
gpm	gallons per minute
igneous rocks	rocks formed by solidification from a molten or partially molten state.
lcy	loose (unpacked) cubic yard

leachate	liquid that has percolated through soil or other medium.
MCA	Montana Code Annotated
MMRA	Montana Metal Mine Reclamation Act
metamorphosed	altered in composition, texture or internal structure, principally by heat, pressure, and introduction of new chemical substances.
mg/L	milligrams per liter
mm	millimeter
oxidation	the combination of a substance with oxygen
ore	a mineral or group of minerals from which a valuable material (usually a metal) can be profitably mined or extracted.
pH	measure of the acidity or alkalinity; 7 is neutral, low numbers are acidic.
PER	Preliminary Environmental Review, precursor to the Environmental Assessment
shear zone	a zone in which shearing has occurred on a large scale so that the rock is crushed and brecciated.
sulfide	referring to a mineral which is a compound of sulfur with more than one element.
WQB	Water Quality Bureau, Department of Health and Environmental Sciences

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